WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION

CONNECTICUT RIVER BASIN
HARTFORD, CONNECTICUT

DESIGN MEMORANDUM NO. 4

CONCRETE MATERIALS

PART I- BOX CONDUIT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1975

23

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1. GENERAL. The project is located within the boundaries of the City of Hartford, Connecticut. The complete project requiring approximately 160,000 cubic yards of concrete will be constructed in two independent phases. Each of the two phases will have a separate construction contract with the second phase commencing approximately one year after start of the first phase. Phase I consists mainly of constructing twin rectangular box conduits in uncompleted gap sections of the existing Park River conduit system. Also required to be constructed are: an inlet structure, a junction structure, a pumping station, and the superstructure for a second pumping station. These structures will be located on the North and South Branch of the Park River, at their confluence, and on the Park River downstream of the confluence. Phase II consists of construction of a deep tunnel auxiliary conduit beginning at the Phase I junction structure, running beneath Park Street to Cedar Street and then continuing in a straight line to the west bank of the Connecticut River. Construction of the tunnel is scheduled to commence at the Connecticut River end and progress towards the junction structure. A permanent cleanout, inspection and work access shaft will be constructed at Governor Street. A general plan showing a complete layout of the project is shown on Plate 4-1.

The basic concrete materials investigation set forth in this Design Memorandum will be applicable for the complete project and therefore for both phases of construction. Construction contract requirements when stated, will be referenced to which construction phase, I or II or both, to which they apply. Any special requirements, necessary studies, or data not submitted in this Design Memorandum dealing with the Auxiliary Conduit concrete will be submitted in Design Memorandum Number 9 "Auxiliary Conduit Tunnel - Site Geology, Foundations, Concrete Materials & Detailed Design of Structures."

2. CONCRETE INVESTIGATION.

a. Phase I. Construction of Phase I will require approximately 78,000 cubic yards of concrete for completion of five sections of twin rectangular box conduit totaling 4030 feet in length, including an inlet structure and junction structure (69,000 cubic yards,) 195 feet of "Tee" type floodwalls (1,000 cubic yards,) 380 feet of "I" type headwalls (300 cy,) one complete pumping station (850 cubic yards,) one pumping station superstructure (150 cubic yards,) and 7,000 cubic yards for concrete fill and other miscellaneous items. Cross sections illustrating typical dimensions for some of the Phase I structures are shown on Plates 4-2 thru 4-4. All of the individual structures require only a single class of concrete. The concrete will not be exposed to high velocity flows of water or exposed to strong sulfate ground water or other corrosive liquids or salts; therefore, only regular quality concrete will be required for durability and permeability considerations. The twin box conduits and their integrated junction and inlet structures will require a structural concrete with a 4,000 psi design strength. The "I" and "Tee" floodwalls and the pumping stations will require a 3000 psi design strength while fill concrete will require a 2000 psi design strength.

b. Phase II. Construction of the Phase II auxiliary conduit tunnel will require approximately 82,000 cubic yards of concrete. The four main elements of the 9,200 foot long auxiliary conduit are the intake, the outlet, the cleanout and inspection shaft, and the deep tunnel. The deep tunnel itself is to be constructed mainly in rock, have an inside diameter of 22 feet and be lined with 2 foot thick concrete with a minimum amount of reinforcing. The concrete tunnel lining will require 74,000 cubic yards, while an additional 4000 cubic yards each will be required for mass concrete and reinforced concrete tunnel in rock. Plans showing the main structures of Phase II and a typical cross section of the tunnel liner are shown on Plates 4-5 and 4-6.

c. Phase I & II.

(1) Air Entrainment. All concrete structures in Phase I and limited portions of Phase II structures will be subjected to severe climatic conditions with alternate cycles of freezing and thawing during the winter months, therefore for durability air entrained concrete is considered mandatory for these structures. The majority of concrete in Phase II will be in the lining of the deep tunnel which will be continually submerged in water and not subjected to alternate freezing and thawing cycles, however, air entrainment will provide increased workability without requiring excessive cement contents to obtain the anticipated desired compressive strengths, (see Plates 4-7 thru 9); therefore, the use of air entrained concrete will be mandatory for both phases of the project.

(2) Field Instructions. Concrete qualities to be required and locations of placements of the different quality concretes will be clearly stated in instructions to the Government Resident Engineer when laboratory design mixtures are furnished. Mixture data will be transmitted on DD Form 1220 and include a listing of control strengths and will either state locations of concrete class use or will be accompanied by instructions delineating its use. Other unusual problems anticipated or special requirements not stated in the specifications, as well as clarification of testing requirements will be included in a compilation of "Engineering Considerations And Instructions For Field Personnel" prepared and issued to the field after award of the contract.

3. CEMENTITIOUS MATERIALS. The size of the monoliths will not result in excessive thermal stresses, and the location of the project structures does not involve sulfate exposure. Therefore, Type I portland cement will satisfy the chemical and physical requirements for this project. The aggregate evaluation did not reveal any potentially deleterious reactive aggregates, therefore low-alkali cement will not be required. Although recent history of cement mills supplying in the project area have shown no problems of false set, false set requirements will be specified. No special investigations of portland cements have been conducted, as cement used in this area is usually supplied by one of eight cement mills located in the Pennsylvania Lehigh Valley or seven cement mills located in the New York Hudson River Valley, or the one mill located in Thomaston, Maine. Some of these mills do not manufacture Type I portland cement but do manufacture Type II, therefore Type I or Type II portland cement will be specified. There are no economically available sources of natural, slag, portland blast-furnace slag or portland-pozzolan cements in this area, so these types of cement will not be specified. In both construction phases the quantity of cement and anticipated rate of use will warrant that specifications require cement to be placed in a bin, submitted to test and then used solely for the supply of that contract. Results of laboratory studies (see Plates 4-7 thru 4-9) on aggregates available for use on this project has shown that cement contents required to obtain desired properties of concrete will vary from an approximate minimum of 400 to an approximate maximum of 700 pounds per cubic yard.

4. POZZOLAN INVESTIGATION. An investigation of commercial sources of pozzolans (fly ash) indicates that there are none economically available in the project area. One previous supplier in the area lost his source of supply when power plants in Connecticut were no longer allowed to burn coal. Other sources of pozzolan would involve long distance rail hauling, transfers, and special storage and handling problems which would increase its cost and more than offset any savings gained by its substitution for portland cement. Therefore due to economic considerations and lack of any necessary requirements for temperature reduction, use of pozzolan will not be specified.

5. WATER. Samples of water have been obtained from Park River and tested in accordance with CRD-C-400. Results showed water to have a Ph of 7.0 and no excessive amounts of sulfates or chlorides. The sample was acceptable as mixing water when tested in accordance with CRD-C-406. Sample exhibited moderate to severe staining when tested in accordance with CRD-C-401. The probable cause of the staining is believed to be a relatively high concentration of iron found in the water. Sources of water proposed by the contractor for mixing and curing concrete will be tested prior to use.

6. AGGREGATE INVESTIGATION.

a. Field Investigation. In view of the location of the project, which is in a highly developed metropolitan area, and the ready availability of local commercial sources of concrete aggregates, the investigation has been confined to commercial suppliers of aggregate. A field reconnaissance was performed in May of 1974 and March of 1975 by an engineer-geologist team to determine the available sources of concrete aggregates. There are five commercial sources of processed fine aggregate and six commercial sources of coarse aggregates within a seventeen mile radius of the project site. Table I lists the sources, location of aggregate pits, plant capacity, type of geologic deposit of materials, and haul distance to the project site. Sources beyond this radius were not included in this investigation due to the relatively longer additional haul distances which would make them non-competitive in price and the fact that they do not normally supply concrete aggregate into the project area.

TABLE I

Source	Pit Location	Plant Capacity (tons per hour)	Haul Distance (miles)	Type Geologic Deposits
The Balf Company	CA-Newington, Conn. FA-South Glastonbury, Conn.	900 200	17 11	Triassic Traprock Pleistocene, Glaciofluvial
Angelo Tomasso Incorporated	CA-New Britain, Conn. FA-Bristol/Southington, Conn.	800 245	11 20	Triassic Traprock Pleistocene, Glaciofluvial
Tomasso of Farmington	CA-Farmington, Conn.	300	10	Triassic Traprock
Roncari Industries Incorporated	CA-East Grandby, Conn. FA-Grandby, Conn.	450 250	17 20	Triassic Traprock Pleistocene, Glaciofluvial
Connecticut Sand and Stone Corporation	CA/ FA/ Unionville, Conn.	600 200	12	Pleistocene, Glaciofluvial
L. Suzio Sand and Gravel Co.	CA/ FA/ Meriden, Conn.	700 200	19	Pleistocene Kame Terrace

The location of the project and the commercial sources of concrete aggregate are shown on Plate 4-10.

The Balf Company obtains their coarse aggregate from a traprock quarry in Newington, Conn. and fine aggregate from their pit in South Glastonbury, Conn. Aggregate is used primarily in bituminous and ready mix portland cement concrete. Angelo Tomasso Incorporated obtains its coarse aggregate from a traprock quarry located in New Britain, Conn. and fine aggregate from a pit located on the border line between Bristol and Southington, Conn. Aggregates are used mainly in bituminous and ready mix portland cement concrete. Tomasso of Farmington is another division of Angelo Tomasso Incorporated and obtains its coarse aggregate from a traprock quarry in Farmington, Conn. Fine aggregate is obtained from the above mentioned Bristol/Southington pit. Aggregates are used in bituminous and ready mix portland cement concrete. Both Tomasso companies are owned by the Ashland Oil and Refining Company. New Haven Trap Rock, which is probably the largest aggregate producer in the state of Connecticut, and possibly capable of supplying the project competitively by rail even from a greater distance than the area investigated, is also owned by Ashland Oil. Both Tomasso and New Haven Trap Rock are now considered the same company, therefore New Haven Trap Rock is not included in this investigation. Roncari Industries Incorporated obtain aggregate from a traprock quarry located in East Grandby, Conn. and a fine aggregate pit located in Grandby, Conn. Aggregates are primarily used in bituminous and ready mix portland cement concrete. Roncari also produces a manufactured aggregate from waste materials which was not considered for use on this project because of availability of natural materials, limited production quantities, lack of control to produce a product of consistent and uniform properties, and uncertainty of aggregate behavior and properties. Roncari natural aggregates are used normally in bituminous and ready mix portland cement concrete. Connecticut Sand and Stone Corporation obtain coarse and fine aggregate from a drag line operation at their pit located in Unionville, Conn. Aggregate is used mainly in ready mix portland cement concrete produced in their own plant. Company officials indicated that they did not wish to allow their aggregate to have evaluation testing performed on it at this time. Reasons given for this policy were twofold. (1) This aggregate in the past has shown high values in the Los Angeles abrasion test, although previous values were not stated. (2) The company is owned by the White Oak Corporation, a contracting firm who may bid on the project. If their company were selected they would choose to submit their aggregate for evaluation testing at that time or use an accepted source. White Oak Corporation has used Tomasso as their aggregate supplier on various occasions in the past. L. Suzio Sand and Gravel Company operate an aggregate processing plant at their pit in Meriden, Conn. They have indicated they have no interest in supplying aggregate for the subject project because of the long haul distance.

Coarse and fine aggregate produced by the Balf Company and Angelo Tomasso Incorporated have been selected for evaluation testing. Connecticut Sand and Stone and L. Suzio Sand and Gravel Company indicated no interest to be tested. Tomasso of Farmington is relatively much smaller than its affiliate Angelo Tomasso Incorporated and company officials indicated the latter one would be used on the subject project, therefore, no testing was performed on Tomasso of Farmington. Roncari Industries Incorporated have been previously tested for a civil works project and have been selected for partial evaluation testing to determine if materials are now similar to when previously tested. Photographs of quarry faces from the three selected sources to be evaluated are shown on Plates 4-14, 4-17 and 4-20. Photographs on Plates 4-15, 4-18 and 4-21 show fine aggregate pits for these same three sources.

b. Tested Sources and Estimated Prices. The sources of aggregate tested and estimated delivered prices of aggregate, based on quoted plant prices and Connecticut Department of Public Utilities minimum trucking rates, which are currently eighty six cents per ton for the first four miles, and ten cents per ton for each additional mile, are as follows:

(1) The Balf Company. Quoted plant prices are $2.30 to $3.95 per ton for crushed stone, depending on the size group and $2.30 per ton for concrete sand. The delivered prices to the site will average $3.93 per ton for crushed stone and $3.86 per ton for concrete sand.

(2) Angelo Tomasso Incorporated. Quoted plant prices are $2.55 to $4.40 per ton for crushed stone, depending on the size group and $2.49 per ton for concrete sand. The delivered prices to the site will average $4.62 per ton for crushed stone and $4.95 per ton for concrete sand.

(3) Roncari Industries Incorporated. Quoted plant prices are $2.40 to $3.95 per ton for crushed stone, depending on the size group and $1.80 per ton for concrete sand. The delivered prices to the site will average $4.95 per ton for crushed stone and $4.26 per ton for concrete sand.

Because of the relative proximity of the site to aggregate sources, only transportation of aggregates by trucking was investigated. No special processing of aggregates is anticipated to be required at this time, therefore there will be no additional costs related to special processing requirements.

c. Aggregate Tests. Results of aggregate tests performed on materials from the three sources selected for testing for this project are summarized on Plates 4-11 and 4-11A thru 4-13 and 4-13A. Results of these tests and other tests performed show that the two previously untested sources have an aggregate of acceptable quality. Test results on Roncari Industries Incorporated, the previously tested source, including petrographic analysis, show that the material is now similar to when previously tested. Previous test results for this source are reported in Technical Memorandum No. 6-370, Volume 5, under the name Material Service, Incorporated, at Latitude 41°N, Longitude 72°W Index Numbers 17 and 17 (Supplemental.) It is noted that previous freeze-thaw tests showed a durability factor equal to 40, which is relatively low in comparison to the factor of 81 for the other two tested sources. It was also previously found through petrographic examination of failed freeze thaw specimens that the low durability was caused by the fine aggregate and the traprock was found to be sound and durable. Strength results for concrete made with Roncari fine and coarse aggregates have shown the highest values of the three tested sources (see Plates 4-7 thru 9) and its service record is considered acceptable.

d. Concrete-making Properties of Aggregates. The water cement ratio and cement factor versus compressive strength curves developed by utilizing concrete aggregates from the sources selected for evaluation are shown on Plates 4-7 thru 4-9.

e. Service Record of Tested Sources. The service records of the aggregates from the three tested sources indicates that they have been used in concrete for a number of Federal, State and local projects. The Balf Company's fine and coarse aggregate are used regularly by Manchester Sand and Gravel who operate ready-mix companies in and around the Hartford area. Concrete from this plant has been utilized in concrete structures on Route 2 in Colchester, Conn. and Interstates I-91 and I-84 in Hartford, Conn. in the Hartford Civic Center, the Hartford Sheraton, the municipal airport, Bradley Field, as well as the Hotel Sonesta and the Constitution Shopping Plaza. The service record of concrete in all of these structures is satisfactory, although it is noted that the period of record is less than 15 years for all but the last two structures mentioned above.

Roncari Industries Incorporated aggregates are used by their own concrete plant. Their service record includes a municipal parking facility in Hartford, Conn., the Hartford Holiday Inn, and many projects at Bradley Field, such as the International Building, the International Terminal Building, the International Warehouse and the "People Mover" conveyor system. The service record for all of these structures is satisfactory, although it is noted that the period of record is less than 15 years.

Angelo Tomasso aggregates are used in concrete mainly by their own concrete plant. Their service record includes use on Interstate I-84 between Southington and Farmington, Conn. Other structures include the West Farm Shopping Plaza and some existing sections of the Park River Conduit, and a municipal parking facility in New Britain, Connecticut. The service record for all of these structures is considered satisfactory, although it is noted that the period of record is less than 15 years. Photographs of some of the above structures from each of the three sources are shown on Plates 4-16, -18, -19 and -22.

f. Recommendations and Conclusions. Based on the data presented herein it is considered that coarse and fine aggregate from all three tested sources are acceptable with the exception of fine aggregate from Roncari Industries Incorporated. The aggregate test results and comparative costs indicate that fine aggregate from sources other than Roncari Industries Incorporated, Grandby, Conn. are superior in quality in regard to durability, and are still economically competitive with this source. It is recommended that all three tested sources of coarse aggregate and two tested sources of fine aggregate, excluding Roncari Industries Incorporated fine aggregate be listed as approved sources in the specifications for each of the two construction phases of the Park River Conduit Project.

7. CONSTRUCTION PLANT INVESTIGATION.

a. Plant Requirements. The maximum size coarse concrete aggregate normally commercially available in the project area is 2 inches, which is manufactured to meet State of Connecticut Specifications. Because of the increased costs of production for a larger size maximum aggregate of 3 inch maximum size and its non-applicability for portions of the structures in Phase I and probable difficulty of placement in Phase II, a 2-inch maximum size aggregate conforming to the State of Connecticut gradation requirements will be specified. Specification gradations for coarse aggregate will be given for three size groups of aggregates, 2 inch, 3/4 inch and 3/8 inch which will be blended to obtain the required maximum density for use in concrete. Considering the maximum size of aggregate, required concrete quantities and availability of commercial plants in the project area, specifications for Phase I and Phase II construction will require use of a semi-automatic plant located "on" or "off" site. Phase I will require a plant with a capacity of 80 cubic yards per hour. Plate 4-1 shows locations where an on-site plant may be located for each construction phase. The Phase I plant could be located within the 15 plus acres located in the "U" shaped area directly north of the junction structure which is also designated as the spoil and stockpile area. This area will be used to stockpile and eventually be filled in with earth and rock excavation from both construction phases. The Phase II plant area could be located within the approximately $7\frac{1}{2}$ acres of contractors work area located in the Urban Renewal area to the east of Governor Street. Both construction phases will require the use of centrally mixed concrete using stationary, tilting, spiral blade or vertical-shaft mixers. Mixers will have a minimum capacity of one cubic yard and will be required in sufficient numbers to produce the above stated required planned capacity using a mixing time of one minute for the first cubic yard, plus 15 seconds for each additional cubic yard of capacity. For both construction phases aggregate size will not warrant specifying rescreening requirements and aggregate data shown on Plates 4-11, -12 and -13 show no reason to indicate that washing of coarse aggregate will be required. No cooling requirements or other unusual plant requirement are anticipated at this time.

b. Available Sources of Concrete. There are four sources of ready-mixed concrete within an 11 mile haul distance of the project site, which are available and capable of producing required concrete for the project. All four sources have central mixing facilities with capacities in excess of predicted project requirements, and all four can meet or exceed semi-automatic plant requirements.

Manchester Sand and Gravel operate a central mix, automatic plant in Hartford, a one mile haul distance to the project site. Coarse and fine aggregate are obtained by truck from the Balf Company.

Roncari Industries Incorporated operate a central mix, semi-automatic plant in Hartford, a one-mile haul distance to the project site. Fine and coarse aggregates are obtained by truck from their own sources.

Connecticut Sand and Stone Corporation operate a central mix, automatic plant in West Hartford, a one and one half mile haul distance to the project site. Coarse and fine aggregates are obtained from their own sources or purchased from Angelo Tomasso Incorporated.

Sherman Tomasso Concrete Incorporated operates a central mix, automatic plant in New Britain, Connecticut an eleven mile haul distance from the project site. Coarse and fine aggregates are obtained from their affiliate, Angelo Tomasso Incorporated.

All four of the above sources have thirty or more transit mix trucks available for transporting concrete. All four have capabilities for heating aggregates if required. Only Connecticut Sand and Stone Corporation has facilities to wash aggregate and only Manchester Sand and Gravel has recorders in its plant at this time.

8. CONVEYING CONCRETE.

a. Conveying Methods. Concrete shall be required to be conveyed as rapidly as possible. All conveying systems will be reviewed prior to use. Specifications will require any buckets used to be bottom dump type and have a capacity not exceeding 2 cubic yards. Truck mixers or aggitators will be reviewed prior to use and will meet requirements of ASTM C 94. Use of pumps of approved design and capacity will be allowed on this project. Only positive displacement pumps will be allowed and use of aluminum pipe will not be permitted. Use of conveyor belts with speeds in excess of 500 feet per minute with mixing hoppers and wipers at each transfer and placing point will be approved after a satisfactory field demonstration. Additional conveying considerations that may be required for Phase II construction such as conventional high pressure pneumatic methods will be discussed in Design Memorandum 9.

b. Time of Delivery. Concrete mixed on-site in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed. Concrete mixed off-site or on-site in stationary mixers and transported by truck mixer or agitator, shall be delivered to the site of the work and discharge shall be completed within $1\frac{1}{2}$ hours after introduction of the cement to either the water or aggregate, except that when the temperature of the concrete exceeds 85°F the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged.

9. INSULATION OF PLACEMENTS. Since the project features include no massive placements which would require full time temperature controls to be imposed, no requirements for insulation of placements will be specified. Only normal cold weather protection as specified in paragraph - - - 16.4 of CE 1401.01 Standard Guide Specifications for Concrete will be invoked.

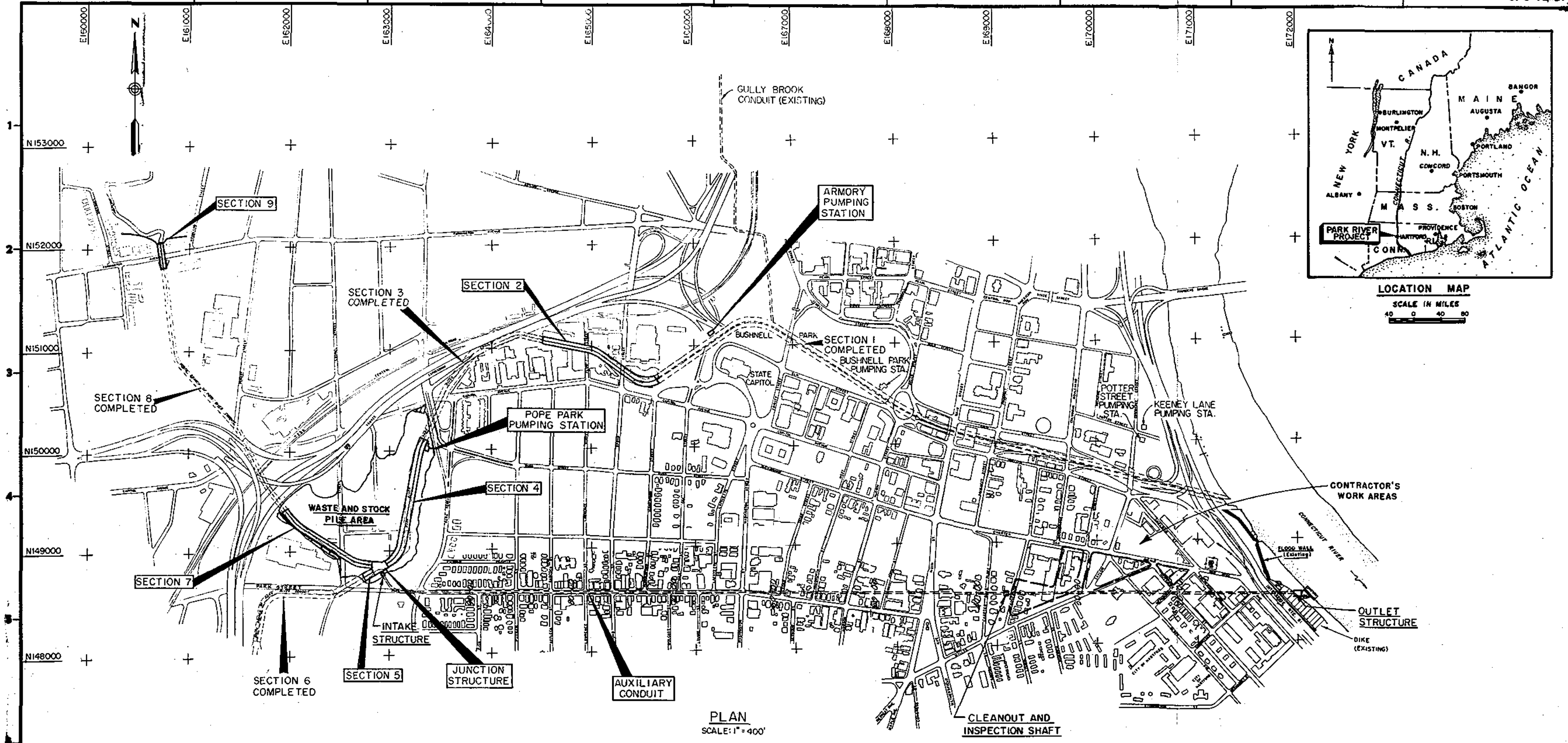
10. INSPECTION REQUIREMENTS

a. Contractor Quality Control. The contractor's quality control for each of the two construction phases shall be required to be a separate organization with no other responsibilities. The size of the organization and qualifications of personnel shall be as outlined in paragraphs 5-1.b(2)(a) and 5-1.b(3) respectively of EM 1110-2-2000, Standard Practice for Concrete. The required minimum testing and inspection performed by the contractor's quality control organization will be in accordance with that specified in paragraph 22 of CE-1401.01 "Standard Guide Specifications for Concrete," for structural concrete.

b. Government Quality Assurance. The Government quality assurance program for each of the two construction contracts shall conform to the requirements of EM-1110-2-2000, Standard Practice for Concrete. Staffs shall be as required in paragraph 5-1.c for a major concrete project. Frequency of testing for verification of compliance with specification requirements of such items as aggregate gradings, moisture content, slump, entrained air content, concrete temperature, etc. shall be as required in the applicable sections of paragraph 5-2. Testing requirements for verification of concrete strength requirements, which will not be stipulated in the specifications, will strictly conform to those stated in paragraphs 5-2c(1) thru (4) for reinforced structural concrete. Any additional or special quality assurance staff or testing requirements for construction of the auxiliary conduit tunnel will be discussed in Design Memorandum Number 9 "Auxiliary Conduit Tunnel - Site Geology, Foundations, Concrete Materials & Detailed Design of Structures."

CORPS OF ENGINEERS

U. S. ARMY



PLAN

SCALE: 1" = 400'

LEGEND

- 31 Greater Hartford Flood Commission Boring (1960-1963)
- FC3 Flood Commission Boring (1960)
- BH6 Connecticut Highway Department (1959)
- FD5 U.S. Army Corps of Engineers Boring
- —— A5 Seismic Line
- W Water
- SD Strom Drain
- SS Sanitary Sewer
- G Gas
- E Electric
- T Telephone
- Bedrock Outcrop

GENERAL NOTES:

1. Elevations refer to Mean Sea Level Datum.
2. All elevations are plus except as noted otherwise.
3. Plane coordinates refer to Connecticut Lambert Grid System.
4. For Seismic Lines and Profiles see D.M. No. 2 Phase II, Part I, "Project Design, Site Geology and Interior Drainage."

GRAPHIC SCALES

1" = 400' 400' 0 400' 800'

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION

GENERAL PLAN

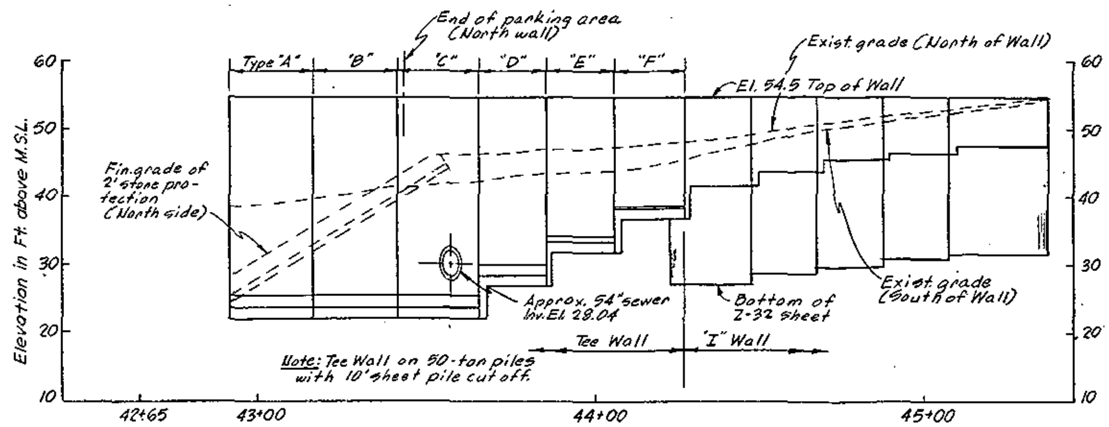
HARTFORD CONNECTICUT

APPROVED DATE

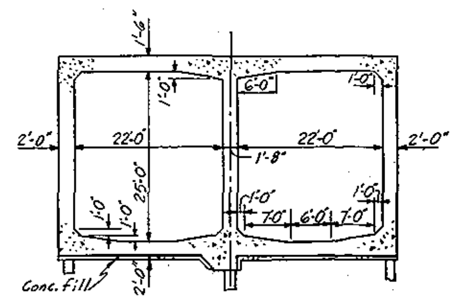
SCALE SPEC. NO.

SHEET

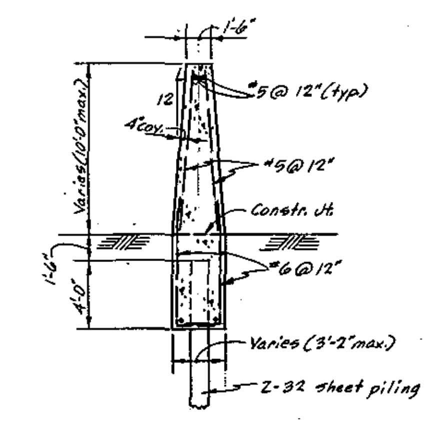
PLATE 4-1



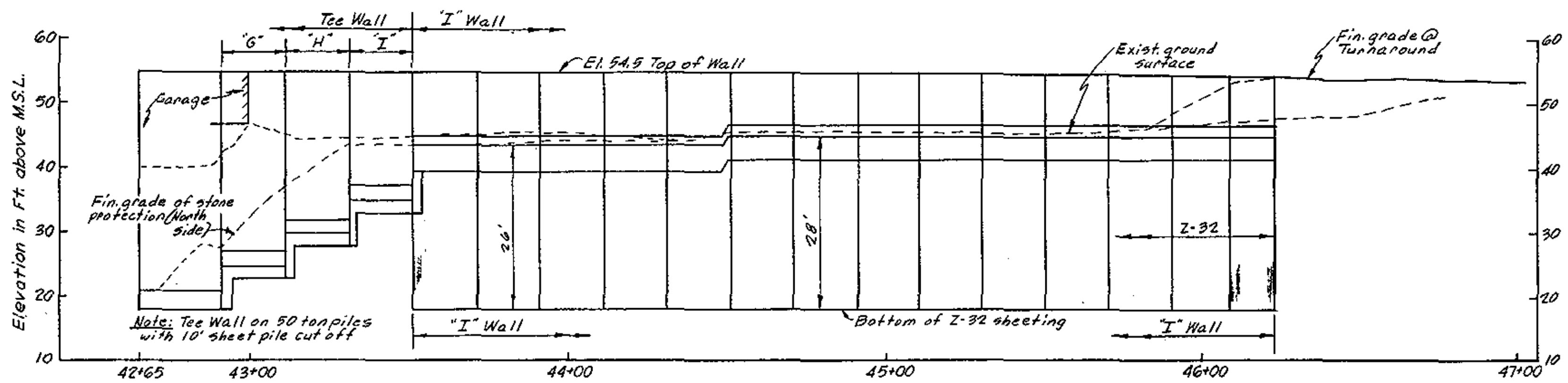
PROFILE EAST FLOOD WALL
SCALE HORZ. 1"=20' VERT. 1"=10'



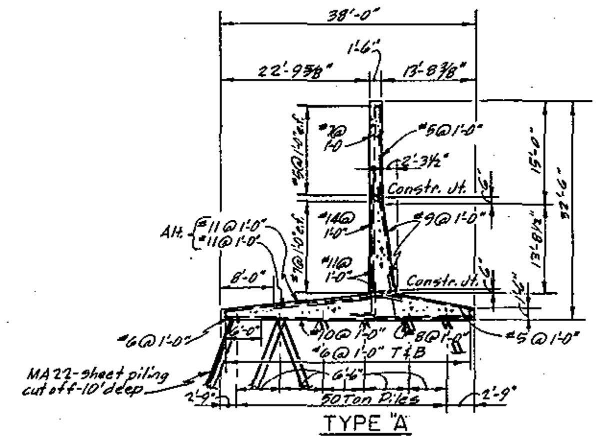
TYPICAL CONDUIT SECTION
SECTION 9
SCALE: 1"=10'



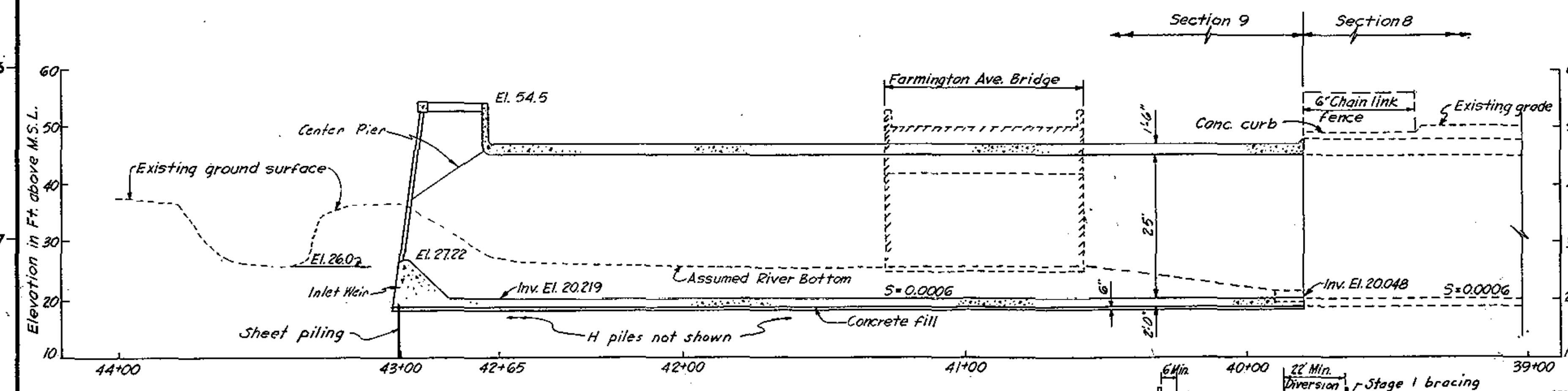
TYPICAL "I" WALL SECTION
SCALE 1/4"=1'-0"



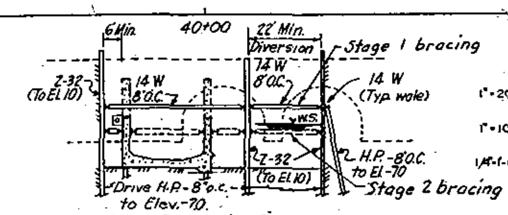
PROFILE WEST FLOOD WALL
SCALE HORZ. 1"=20' VERT. 1"=10'



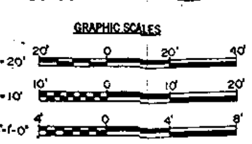
TYPE "A"
TYPICAL "TEE" WALL SECTION
SCALE 1"=10'



SECTIONAL PROFILE - SECTION 9
SCALE HORZ. 1"=20' VERT. 1"=10'



TYPICAL STREAM DIVERSION
(SECTION 9 at Sta. 40+80)
SCALE 1"=20'



SAFETY PAYS

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
BOX CONDUIT AT SECTION 9
PROFILES AND SECTIONS

HARTFORD CONNECTICUT

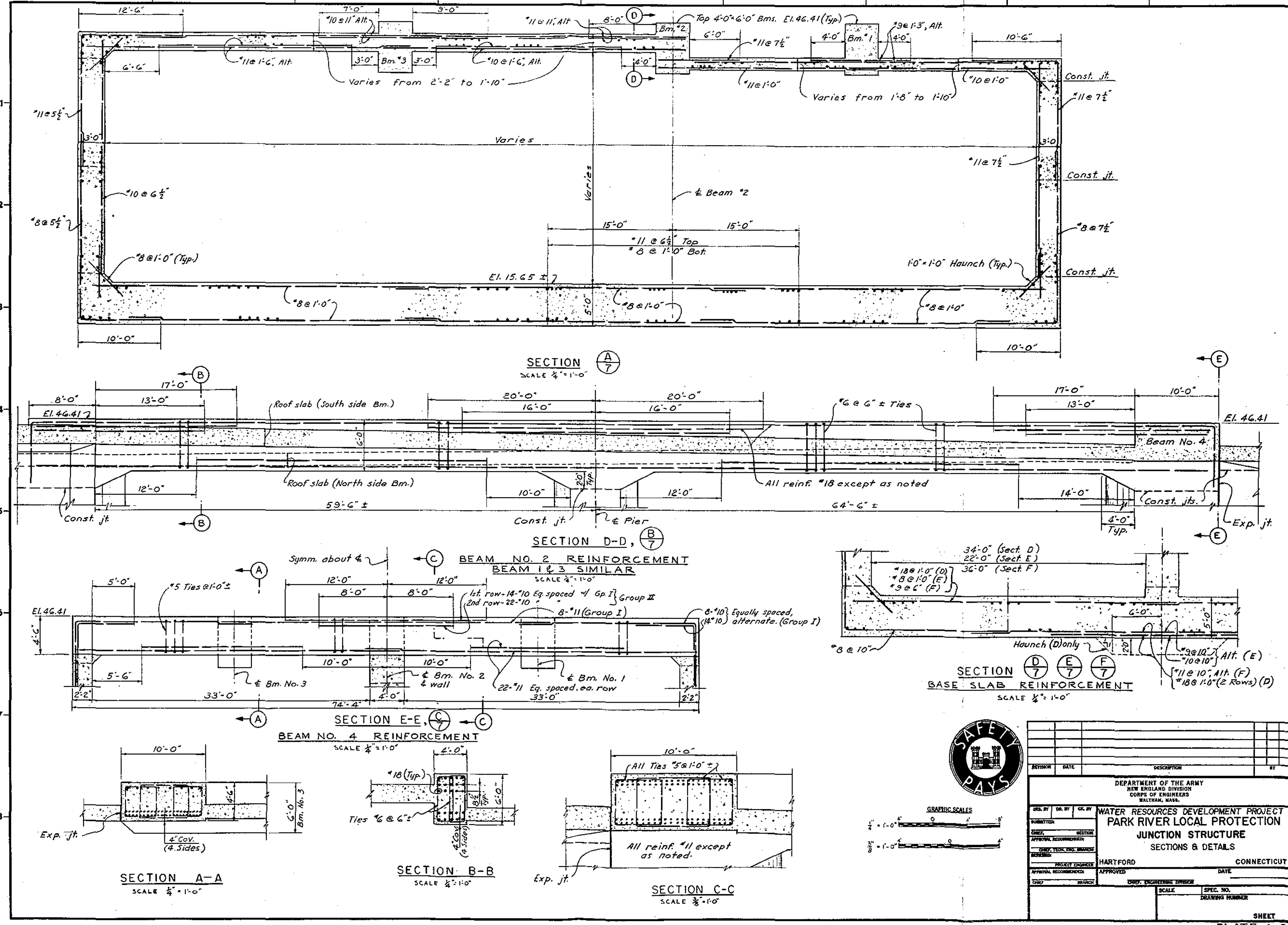
DR. BY J.A.P.

APPROVED DATE

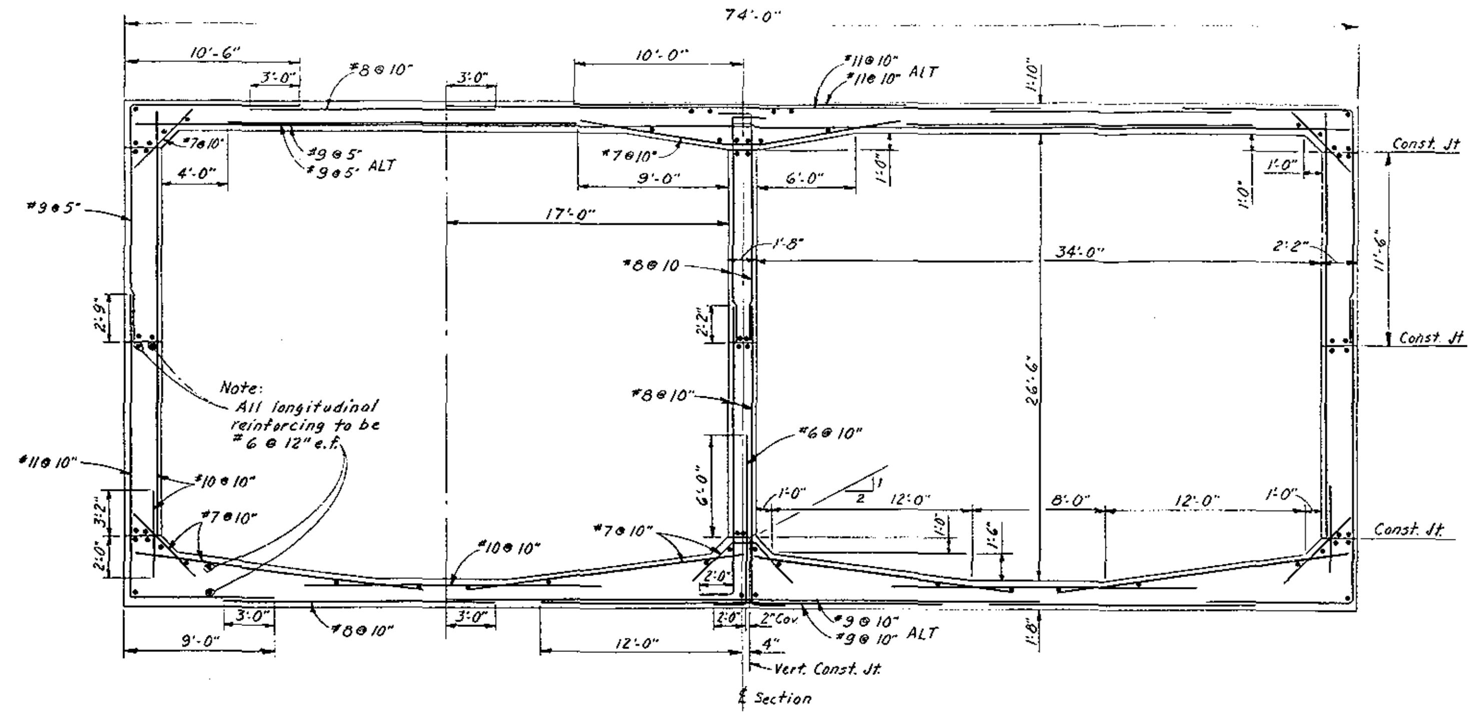
CHIEF, ENGINEERING DIVISION

SCALE | SPEC. NO. | DRAWING NUMBER | SHEET

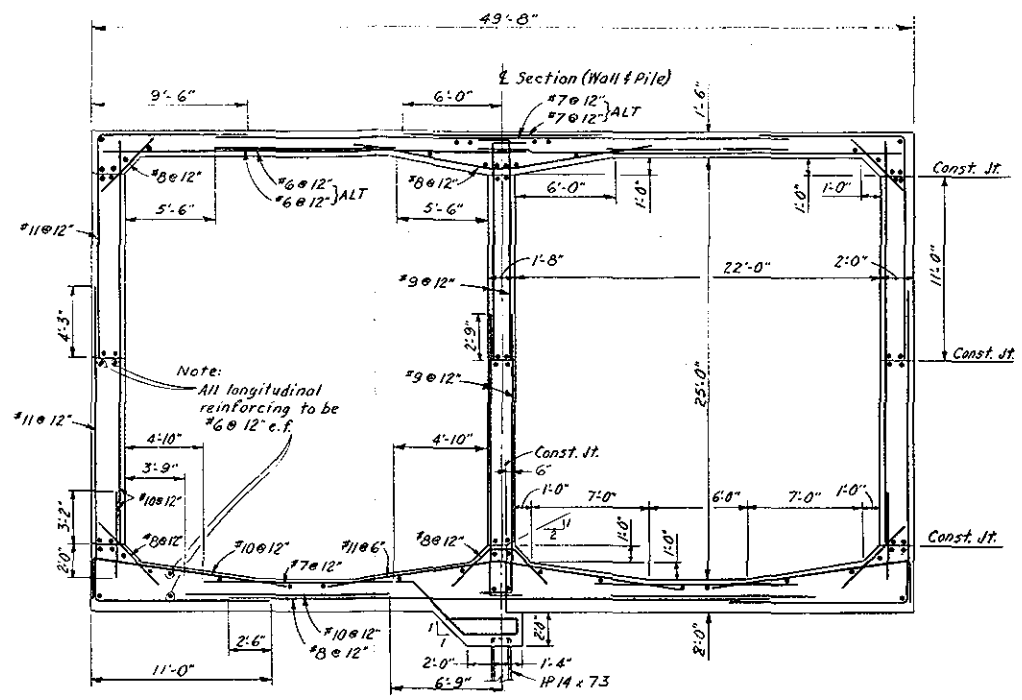
PLATE 4-2


SECTION A/7
SCALE 1/4" = 1'-0"
Varies from 2'-2" to 1'-10"
Varies from 1'-8" to 1'-10"
Top 4'-0"x6'-0" Bms. El. 46.41 (Typ.)
Varies
℄ Beam #2
#11 @ 6 1/2" Top
#8 @ 1'-0" Bot.
1'-0" x 1'-0" Haunch (Typ.)
El. 15.65 ±
Const. jt.
SECTION D-D, B/7
BEAM NO. 2 REINFORCEMENT
BEAM 1 & 3 SIMILAR
SCALE 1/4" = 1'-0"
Roof slab (South side Bm.)
Roof slab (North side Bm.)
#6 @ 6" ± Ties
All reinf. #18 except as noted
Beam No. 4
El. 46.41
59'-6" ±
64'-6" ±
℄ Pier
Exp. jt.
Const. jts.
SECTION E-E, C/7
BEAM NO. 4 REINFORCEMENT
SCALE 1/4" = 1'-0"
Symm. about ℄
#5 Ties @ 1'-0" ±
1st row-14-#10 Eq. spaced w/ Gp I
2nd row-22-#10
Group II
8-#11 (Group I)
8-#10 / 14-#10 Equally spaced, alternate. (Group I)
22-#11 Eq. spaced, ea. row
℄ Bm. No. 3
℄ Bm. No. 2 & wall
℄ Bm. No. 1
SECTION D/7 E/7 F/7
BASE SLAB REINFORCEMENT
SCALE 1/4" = 1'-0"
34'-0" (Sect. D)
22'-0" (Sect. E)
36'-0" (Sect. F)
#18 @ 1'-0" (D)
#8 @ 1'-0" (E)
#9 @ 6" (F)
#8 @ 10"
Haunch (D) only
#9 @ 10" / #10 @ 10" Alt. (E)
#11 @ 10", Alt. (F)
#18 @ 1'-0" (2 Rows) (D)
SECTION A-A
SCALE 1/2" = 1'-0"
4" Cov. (4 Sides)
Exp. jt.
Bm. No. 3
SECTION B-B
SCALE 1/2" = 1'-0"
#18 (Typ.)
Ties #6 @ 6" ±
4" Cov. (4 sides)
SECTION C-C
SCALE 3/8" = 1'-0"
All Ties #5 @ 1'-0" ±
All reinf. #11 except as noted.
SAFETY PAYS
GRAPHIC SCALES
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
JUNCTION STRUCTURE
SECTIONS & DETAILS
HARTFORD CONNECTICUT

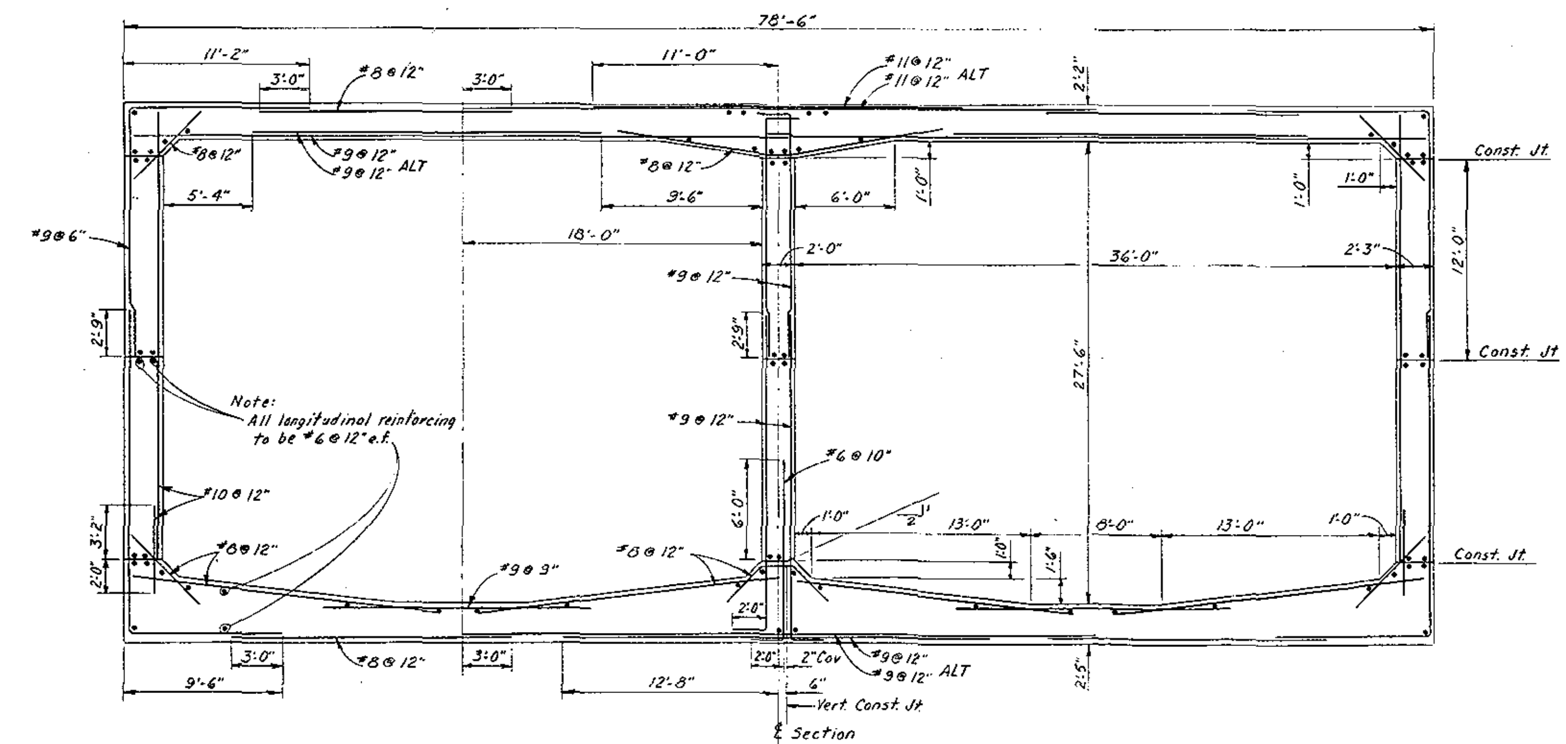
CORPS OF ENGINEERS | U. S. ARMY



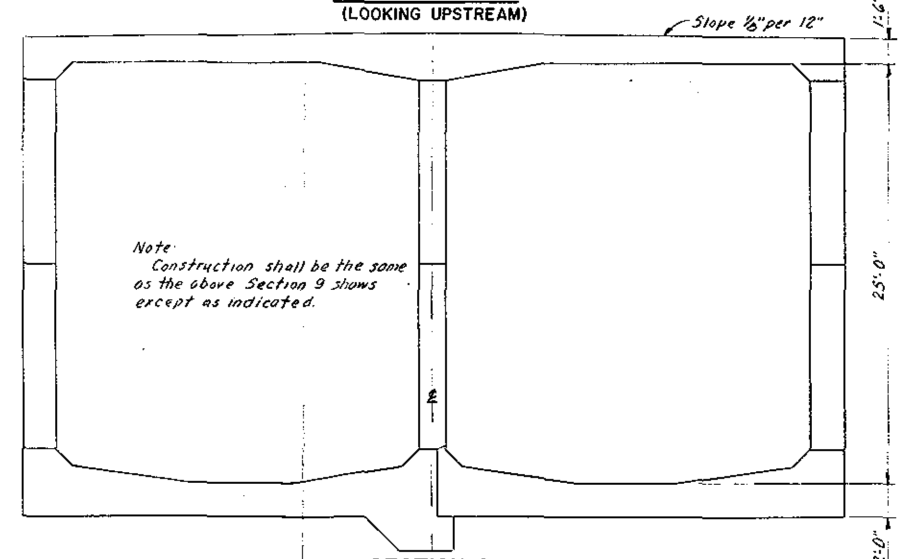
SECTION 4
(MON. NO. I THRU 44)



SECTION 9
(MON. NO. I THRU 5)
(LOOKING UPSTREAM)



SECTION 5
(MON. NO. I THRU 5)



SECTION 9
(MON. NO. 6 THRU 9)
(LOOKING UPSTREAM)

Note
All dimensions & reinforcement sizes on all sections are symmetrical about ℄'s, except at bottom center of all sections construction shall be one way as indicated.

GRAPHIC SCALES
1/4" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY W.R. | DR. BY R.D.P. | CK. BY

WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
BOX CONDUITS AT SECTIONS 4,5 & 9
SECTIONS

HARTFORD | CONNECTICUT

APPROVED | DATE

CHIEF, ENGINEERING DIVISION

SCALE 1/4"=1'-0" | SPEC. NO.

DRAWING NUMBER

SHEET

PLATE 4-4

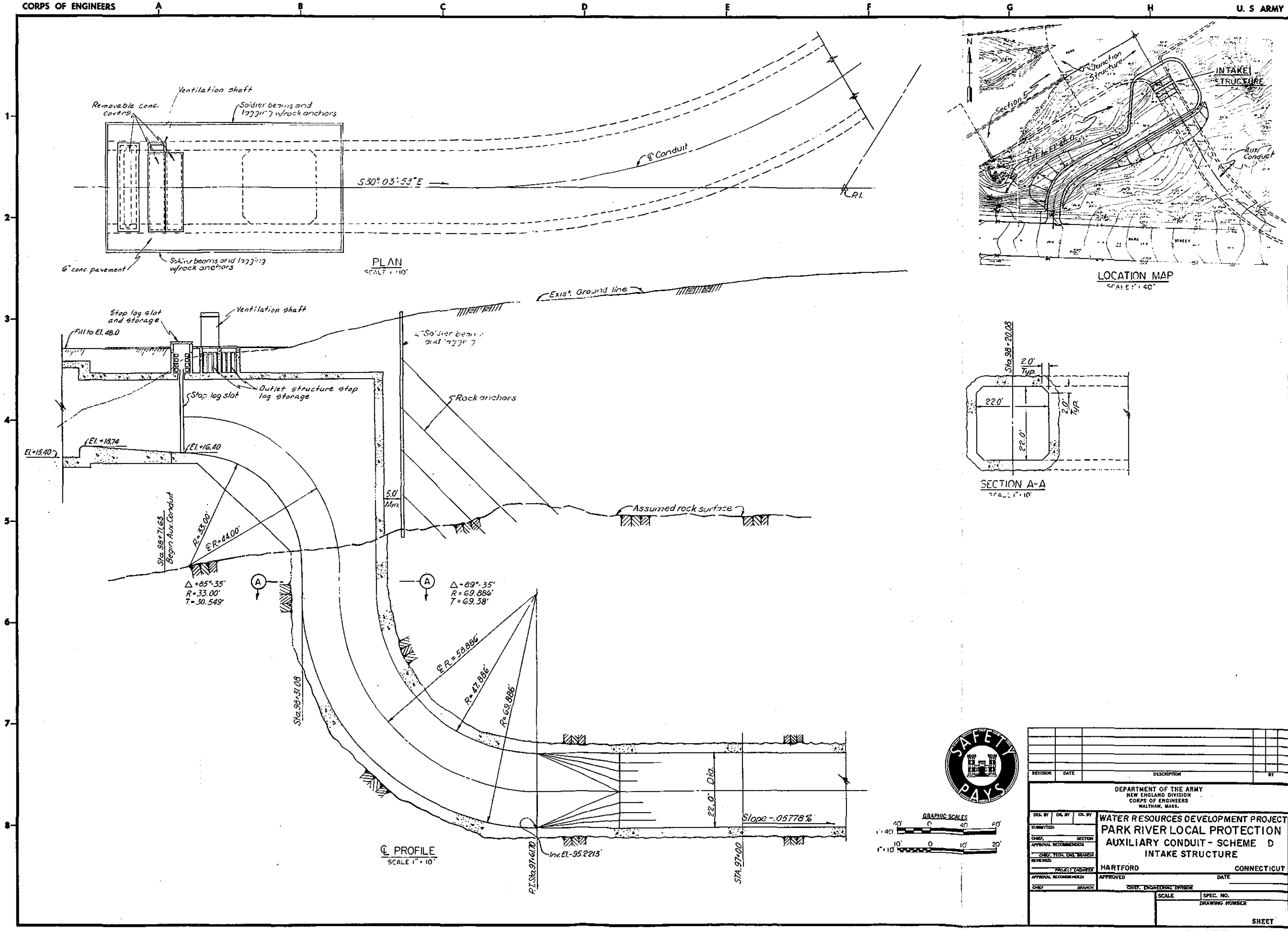

CORPS OF ENGINEERS
U. S ARMY
Ventilation shaft
Removable conc. covers
Soldier beams and lagging w/rock anchors
℄ Conduit
S30° 03' 53" E
P.I.
6" conc. pavement
Soldier beams and lagging w/rock anchors
PLAN
Exist. Ground line
Stop log slot and storage
Ventilation shaft
Fill to El. 48.0
Soldier beams and lagging
Stop log slot
Outlet structure stop log storage
Rock anchors
El. +18.74
El. +16.40
El. +15.40
5.0' Min.
Assumed rock surface
Sta. 98+71.63 Begin Aux. Conduit
R=33.00'
℄ R=44.00'
Δ=85°-35'
R=33.00'
T=30.549'
Δ=69°-35'
R=69.886'
T=69.38'
℄ R=58.886'
R=47.886'
R=69.886'
Sta. 98+31.08
22.0' Dia.
Slope -.05778%
Inv. El. -35.2213'
P.T. Sta. 97+61.70
STA. 97+00
℄ PROFILE
SCALE 1" = 10'
LOCATION MAP
N
Junction Structure
Section 5-5
INTAKE STRUCTURE
Aux. Conduit
STREET
Sta. 98+20.08
2.0' Typ.
22.0'
22.0'
2.0' Typ.
SECTION A-A
SAFETY PAYS
GRAPHIC SCALES
1"=40' 40' 0 40' 80'
1"=10' 10' 0 10' 20'
REVISION
DATE
DESCRIPTION
BY
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
DES. BY
DR. BY
CK. BY
SUBMITTED:
CHIEF, SECTION
APPROVAL RECOMMENDED:
CHIEF, TECH. ENG. BRANCH
REVIEWED:
PROJECT ENGINEER
APPROVAL RECOMMENDED:
CHIEF BRANCH
WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
AUXILIARY CONDUIT - SCHEME D
INTAKE STRUCTURE
HARTFORD
CONNECTICUT
APPROVED
DATE
CHIEF, ENGINEERING DIVISION
SCALE
SPEC. NO.
DRAWING NUMBER
SHEET

PLATE 4-5

CORPS OF ENGINEERS | U. S. ARMY

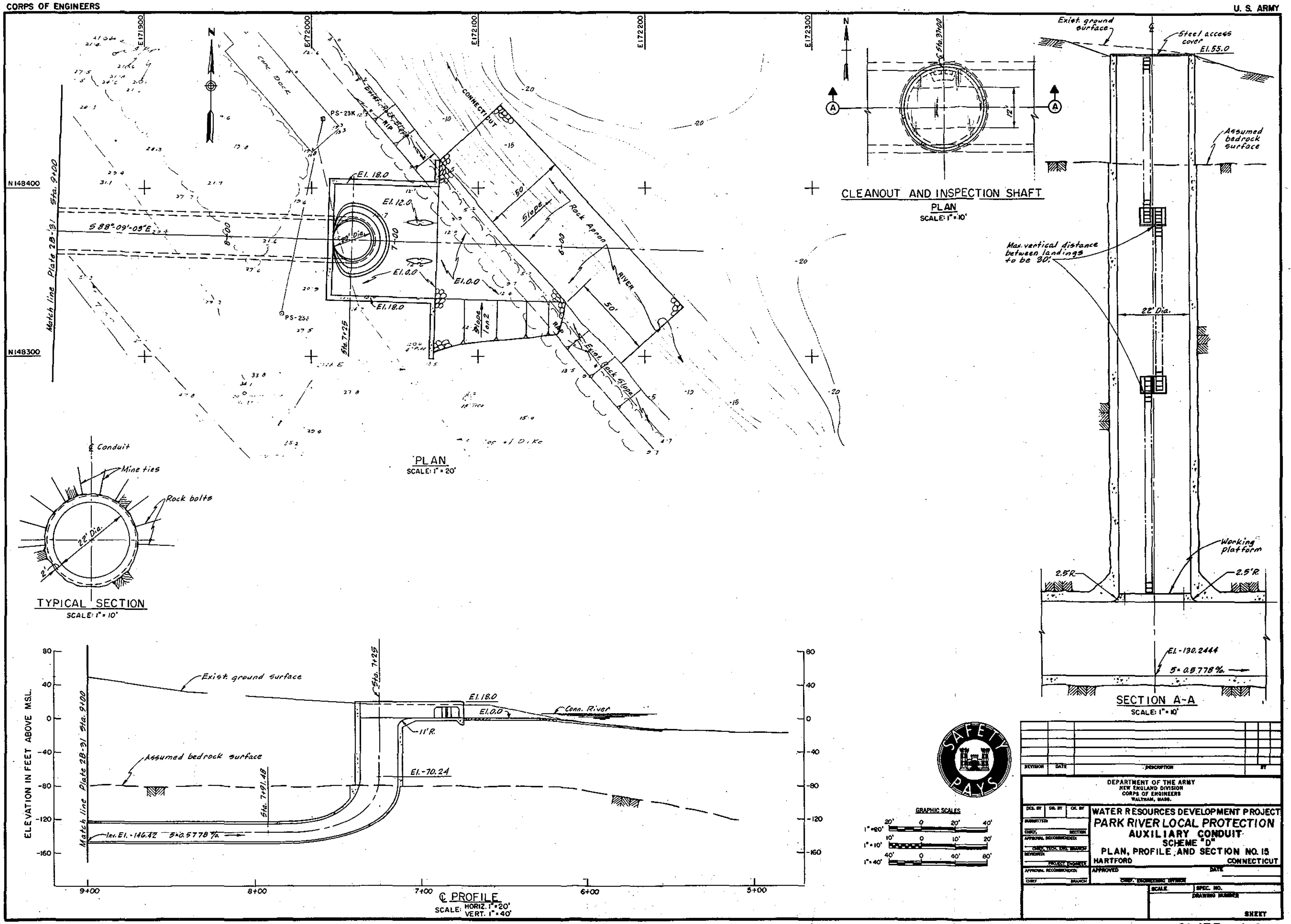
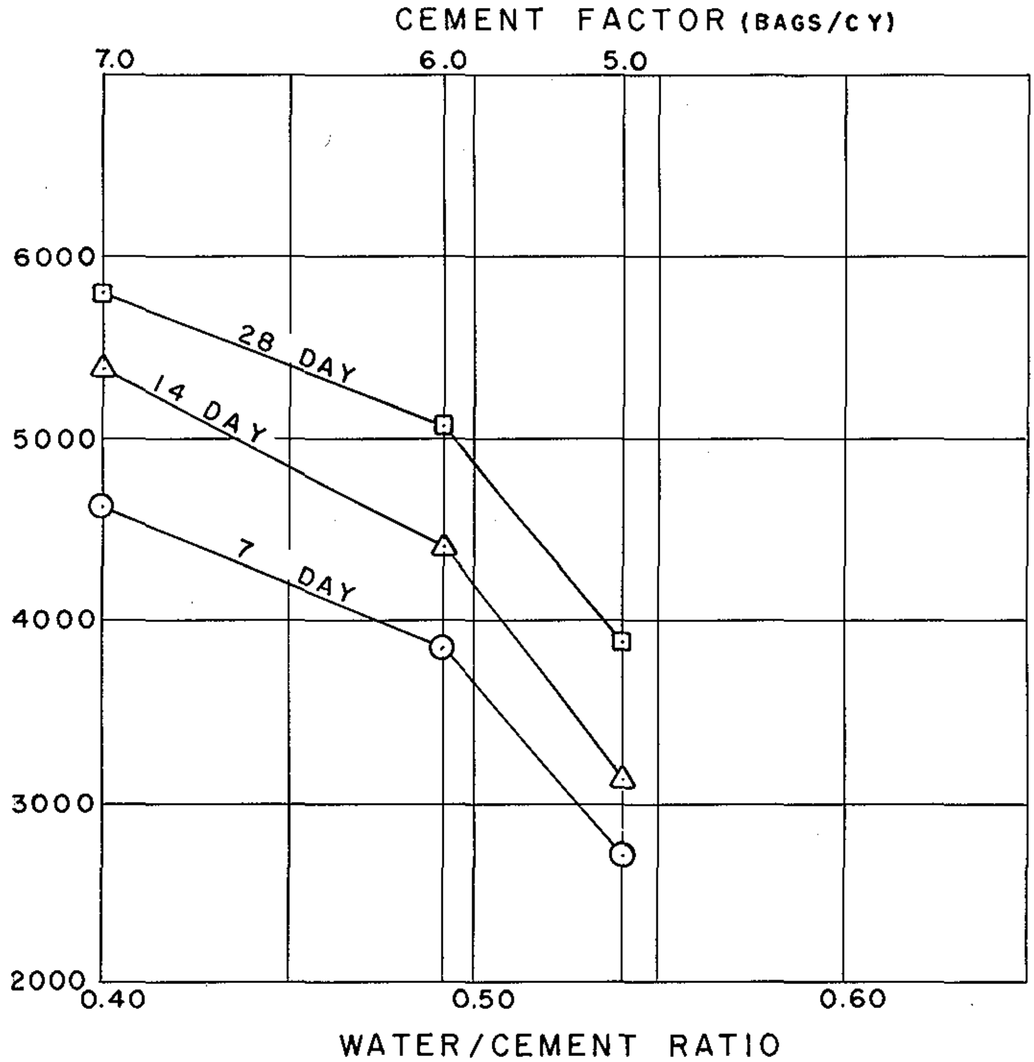


PLATE 4-6



FINE AGGREGATE

RONCARI INDUSTRIES
GRANBY, CONNECTICUT

COARSE AGGREGATE

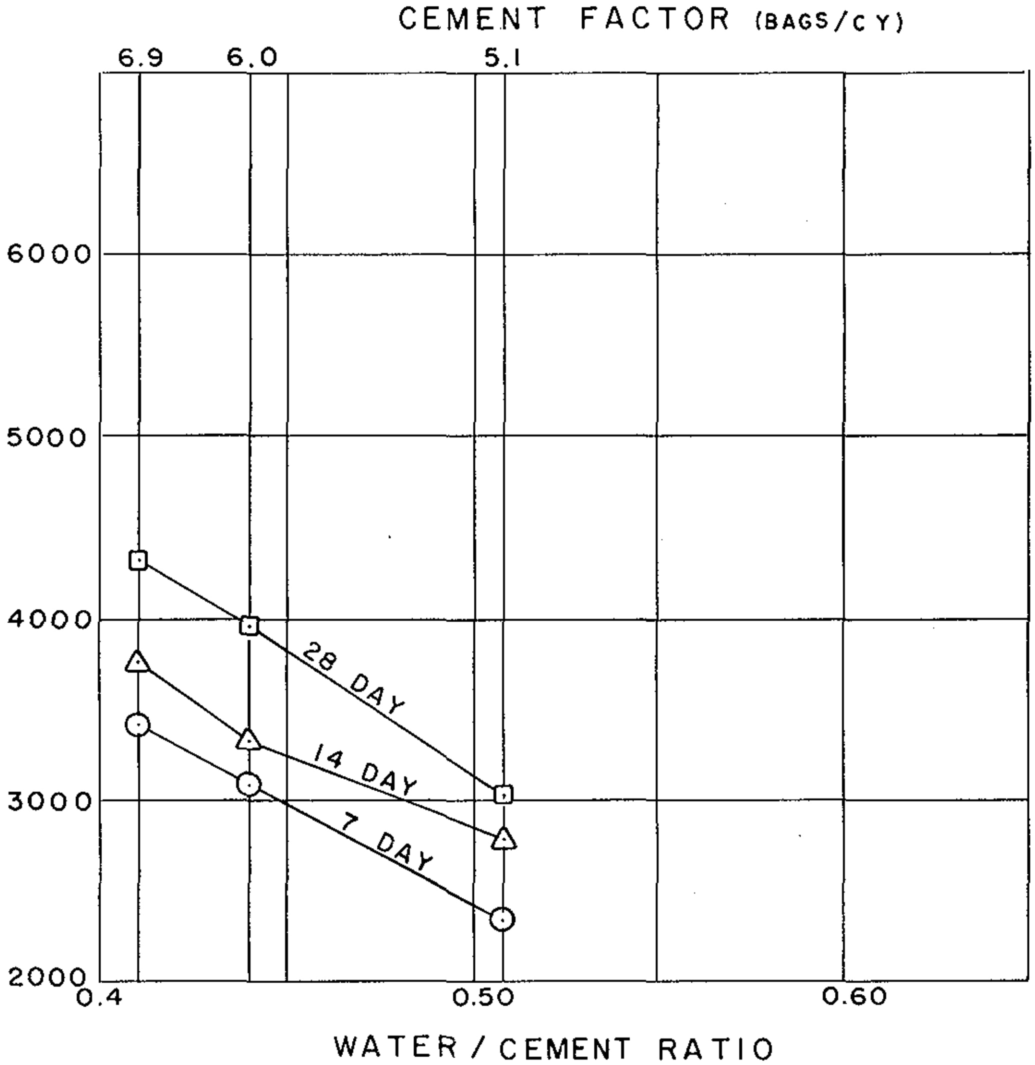
RONCARI INDUSTRIES
EAST GRANBY, CONNECTICUT

NOTE:

CONCRETE WITH 1 1/4" MAX. SIZE COARSE AGGREGATE, 3 1/2" SLUMP, 5.5% ENTRAINED AIR, TYPE II PORTLAND CEMENT.

WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
CONCRETE MAKING PROPERTIES
HARTFORD CONNECTICUT

PLATE 4-7



FINE AGGREGATE

THE BALF COMPANY
SOUTH GLASTONBURY, CONNECTICUT

COARSE AGGREGATE

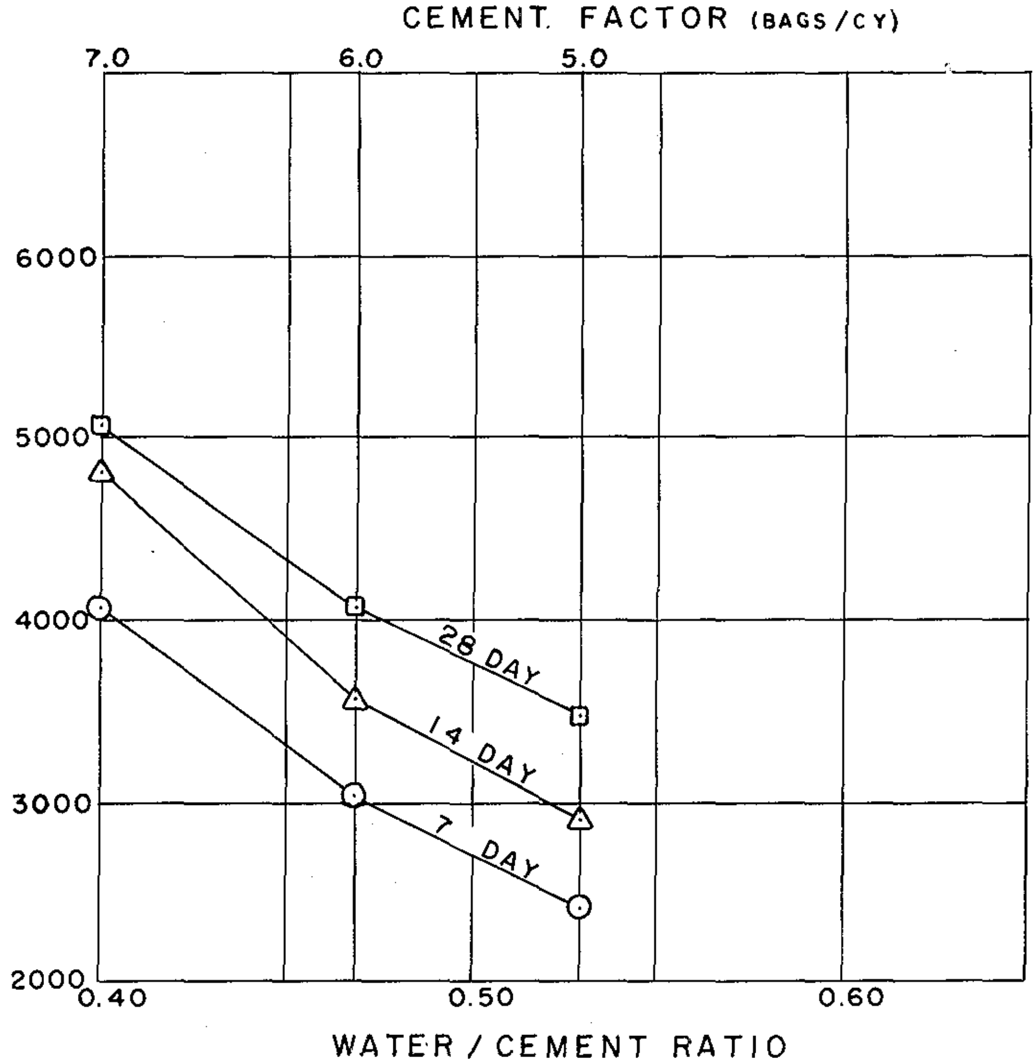
THE BALF COMPANY
NEWINGTON, CONNECTICUT

NOTE:

CONCRETE WITH 1 1/4" MAX. SIZE COARSE AGGREGATE, 3 1/2" SLUMP, 6 % ENTRAINED AIR, TYPE II PORTLAND CEMENT.

WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
CONCRETE MAKING PROPERTIES
HARTFORD CONNECTICUT

PLATE 4-8



FINE AGGREGATE

ANGELO TOMASSO, INCORPORATED
NEW BRITAIN, CONNECTICUT

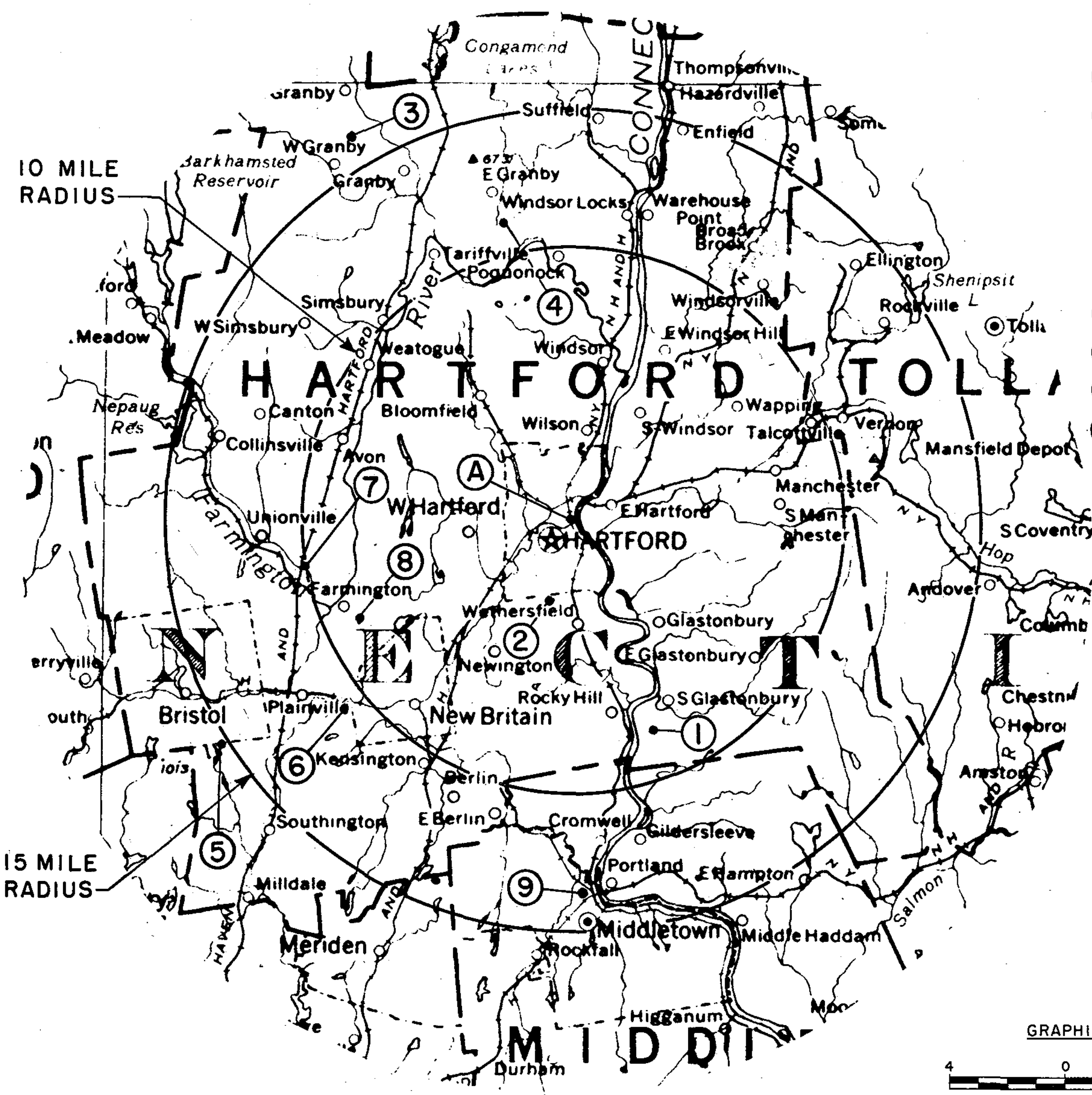
COARSE AGGREGATE

ANGELO TOMASSO, INCORPORATED
BRISTOL, CONNECTICUT

NOTE:

CONCRETE WITH 1 1/4" MAX. SIZE COARSE AGGREGATE, 3 1/2" SLUMP, 6% ENTRAINED AIR, TYPE II PORTLAND CEMENT.

WATER RESOURCES DEVELOPMENT PROJECT
PARK RIVER LOCAL PROTECTION
CONCRETE MAKING PROPERTIES
HARTFORD CONNECTICUT



Ⓐ PARK RIVER LOCAL PROTECTION PROJECT

① F.A. - THE BALF COMPANY

② C.A. - THE BALF COMPANY

③ F.A. - RONCARI INDUSTRIES, INC.

④ C.A. - RONCARI INDUSTRIES, INC.

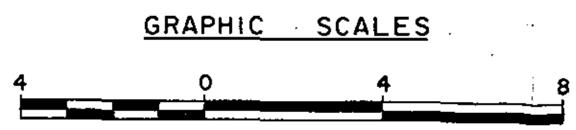
⑤ F.A. - A. TOMASSO, INC.

⑥ C.A. - A. TOMASSO, INC.

⑦ F.A. & C.A. - CONNECTICUT SAND & STONE

⑧ C.A. - TOMASSO OF FARMINGTON

⑨ L. SUZIO SAND AND GRAVEL CO.



WATER RESOURCES DEVELOPMENT PROJECT

PARK RIVER LOCAL PROTECTION

CONCRETE MAKING PROPERTIES

HARTFORD CONNECTICUT

PLATE 4-10

STATE: Conn.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Materials Lab
LAT.: 41°N	LONG.: 72°W		DATE: March 1975

LAB. SYMBOL NO.: 71-251-2 thru 4 TYPE OF MATERIAL: Processed Trap Rock

LOCATION: South Main St., East Granby, Conn.

PRODUCER: Roncari Industries Inc. (commercial)

SAMPLED BY: N.E.D. R. Gauvreau

TESTED FOR: Park River Local Protection, Hartford, Conn.

USED AT Previously tested for Colebrook Dam

PROCESSING BEFORE TESTING Crushing and sizing by producer

GEOLOGICAL FORMATION AND AGE: Triassic Traprock

GRADING (CRD-C 103)(CUM. % PASSING):

SIEVE / SIZE		1¼"	3/4"	½"	FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN.					
1½ IN.		100	100		
1 IN.		72	98		
¾ IN.		23	93	100	
½ IN.		1.3	15	89	
⅜ IN.		0.7	3.0	35	
NO. 4		0.6	0.9	1.7	
NO. 8		0.6	0.6	1.1	
NO. 16		0.6	0.5	0.9	
NO. 30		0.5	0.4	0.8	
NO. 50		0.5	0.4	0.7	
NO. 100		0.5	0.3	0.6	
NO. 200		0.4	0.1	0.5	
-200[a]		0.6	0.2	0.7	
F.M.[b]		9.00	7.89	6.70	

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

		1¼"	3/4"	½"	FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):		2.93	2.92	2.90	
ABSORPTION, PER CENT (CRD-C 107,108):		0.8	1.0	1.2	
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	
SOFT PARTICLES, PER CENT (CRD-C 130):					—
PER CENT LIGHTER THAN SP. GR.____(CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):		8.1	4.5	7.3	
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)		0.6	1.9	2.8	
ABRASION LOSS (L. A.), %, (CRD-C 117):			14.8		
UNIT WT., LB/CU FT (CRD-C 106):		98.7	99.5	96.7	
CLAY LUMPS, % (CRD-C 118)					
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128):	Sc, mM/L:				
	Rc, mM/L:				

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE II CEMENT, RATIO 7 DAYS, 107.2%, ________ DAYS, ________%

LINEAR THERMAL EXPANSION $X10^{-6}$/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):	FINE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.	COARSE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):			F & T	HW-CD	HD-CW
FINE AGG.	COARSE AGG:	DFE_{300}			
FINE AGG.	COARSE AGG:	DFE_{300}			

PETROGRAPHIC DATA (CRD-C 127):

The coarse aggregate is composed of about 93% basalt and 6% gabbro. The particles are dense, hard, and angular. No significant deleterious materials were found. The material is suitable for use in concrete. Composition varies slightly from petrographic results obtained in 1963 (Lab. No. 73-51.) Concrete made with this aggregate in 1963 showed DFE 300 equal to 40.

REMARKS:

STATE: Conn.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Material Lab
LAT.: 41°N	LONG.: 72°W		DATE: March 1975

LAB. SYMBOL NO.: 71-251-1 TYPE OF MATERIAL: Processed Sand

LOCATION: Grandby, Connecticut

PRODUCER: Roncari Industries Incorporated (commercial)

SAMPLED BY: N.E.D. R. Gauvreau

TESTED FOR: Park River Local Protection, Hartford, Conn.

USED AT Previously tested for Colebrook Dam

PROCESSING BEFORE TESTING Sizing and washing at pit

GEOLOGICAL FORMATION AND AGE: Pleistocene, Glaciofluvial

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE / SIEVE					FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN					
1½ IN.					
1 IN.					
¾ IN.					
½ IN.					
⅜ IN.					100
NO. 4					98
NO. 8					92
NO. 16					79
NO. 30					51
NO. 50					22
NO. 100					7.8
NO. 200					2.2
-200[a]					2.3
F.M.[b]					2.501

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

					FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):					2.65
ABSORPTION, PER CENT (CRD-C 107,108):					1.1
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	1-
SOFT PARTICLES, PER CENT (CRD-C 130):					—
PER CENT LIGHTER THAN SP. GR.____ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):					
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)					4.1
ABRASION LOSS (L. A.), %, (CRD-C 117):					
UNIT WT., LB/CU FT (CRD-C 106):					110.7
CLAY LUMPS, % (CRD-C 118)					
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L					
Rc, mM/L					

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE II CEMENT, RATIO 7 DAYS, 107.2 %, ____ DAYS, ____ %

LINEAR THERMAL EXPANSION $X10^{-6}$/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):	FINE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.	COARSE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):		F & T	HW-CD	HD-CW
FINE AGG. COARSE AGG:	DFE_{300}			
FINE AGG. COARSE AGG:	DFE_{300}			

PETROGRAPHIC DATA (CRD-C 127):

The fine aggregate is composed of 68% quartz and quartzite, 15% feldspar, 2% granitics, 5% red siltstone and red sandstone, and 10% miscellaneous types. About 95% are hard, dense, nondeleterious particles. About 5% are poor quality red siltstone and red sandstone. The sand is considered adequate for use in concrete. The reddish particles may color the concrete slightly. The composition is similar to that reported in July 1963 (Lab No. 73-51.) Concrete made with this aggregate in 1963 should DFE 300 equal to 40.

REMARKS:

STATE: Conn.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Materials Lab
LAT.: 41°N	LONG.: 72°W		DATE: March 1975

LAB. SYMBOL NO.: 71-252-2 thru 4 TYPE OF MATERIAL: Processed Trap Rock

LOCATION: Newington, Conn.

PRODUCER: The Balf Company

SAMPLED BY: N.E.D. R. Gauvreau

TESTED FOR: Park River Local Protection, Hartford, Conn.

USED AT

PROCESSING BEFORE TESTING Crushing and sizing by producer

GEOLOGICAL FORMATION AND AGE: Triassic Traprock

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE / SIEVE		1¼"	3/4"	½"	FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN.					
1½ IN.		100			
1 IN.		53	100		
¾ IN.		4.1	95	100	
½ IN.		0.6	17	97.4	
⅜ IN.		0.5	2.7	71.2	
NO. 4		0.4	1.5	3.8	
NO. 8			1.3	1.0	
NO. 16			1.1	0.9	
NO. 30			1.0	0.8	
NO. 50			1.1	0.8	
NO. 100			0.9	0.7	
NO. 200			0.7	0.6	
- 200[a]			0.9	0.8	
F.M.[b]		9.41	7.79	6.23	

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

		1¼"	3/4"	½"	FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107, 108):		2.94	2.97	2.90	
ABSORPTION, PER CENT (CRD-C 107, 108):		0.55	0.72	1.13	
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	
SOFT PARTICLES, PER CENT (CRD-C 130):					—
PER CENT LIGHTER THAN SP. GR. ____ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119, 120):		2.1	2.7	9.2	
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)		1.14	1.45	2.0	
ABRASION LOSS (L. A.), %, (CRD-C 117):		---	1.0	---	
UNIT WT., LB/CU FT (CRD-C 106):		103.4	102	95.3	
CLAY LUMPS, % (CRD-C 118)					
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128):	Sc, mM/L:				
	Rc, mM/L:				

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE ____ CEMENT, RATIO ____ 7 DAYS, 97.8 % ____ DAYS, ____ %

LINEAR THERMAL EXPANSION $\times 10^{-6}$/DEG. F. (CRD-C 125, 126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):	FINE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.	COARSE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):			F & T	HW-CD	HD-CW
FINE AGG. The Balf Co.	COARSE AGG: The Balf Co.	DFE_{300}	81		
FINE AGG.	COARSE AGG:	DFE_{300}			

PETROGRAPHIC DATA (CRD-C 127):

The quarry rock consists of 97 percent fresh to slightly weathered diabase and 3 percent miscellaneous slight to moderately weathered diabase and white calcite veined diabase.

Physically, the quarry rock is hard, dense, angular to subangular, rough surfaced and essentially equidimensional in particle shape.

The quarry rock is free of potentially deleteriously reactive materials apt to react with alkalies of cement.

REMARKS:

STATE: Conn.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Materials Lab
LAT.: 41°N	LONG.: 72°W		DATE: March 1975

LAB. SYMBOL NO.: 71-252-1 TYPE OF MATERIAL: Processed Sand

LOCATION: South Glastonbury

PRODUCER: The Balf Company

SAMPLED BY: N.E.D. R. Gauvreau

TESTED FOR: Park River Local Protection, Hartford, Conn.

USED AT

PROCESSING BEFORE TESTING Sizing and washing at pit

GEOLOGICAL FORMATION AND AGE: Pleistocene, glaciofluvial

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE / SIEVE					FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN.					
1½ IN.					
1 IN.					
¾ IN.					100
½ IN.					97
⅜ IN.					91
NO. 4					78
NO. 8					51
NO. 16					15
NO. 30					2.3
NO. 50					0.3
NO. 100					1.1
NO. 200					2.66
-200[a]					
F.M.[b]					

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

					FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):					2.62
ABSORPTION, PER CENT (CRD-C 107,108):					1.08
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	0
SOFT PARTICLES, PER CENT (CRD-C 130):					—
PER CENT LIGHTER THAN SP. GR. ___ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):					
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)					7.95
ABRASION LOSS (L.A.), %, (CRD-C 117):					
UNIT WT., LB/CU FT (CRD-C 106):					105.9
CLAY LUMPS, % (CRD-C 118)					
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L:					
Rc, mM/L:					

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE ___ CEMENT, RATIO 7 DAYS, 97.8 %, ___ DAYS, ___ %

LINEAR THERMAL EXPANSION X10⁻⁶/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):	FINE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.	COARSE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):			F & T	HW-CD	HD-CW
FINE AGG. The Balf Co.	COARSE AGG: The Balf Co.	DFE 300	81		
FINE AGG.	COARSE AGG:	DFE 300			

PETROGRAPHIC DATA (CRD-C 127):

The sand contains 74% quartz, 7% feldspar, 5% granite, 5% sandstone, 4% ferruginous siltstone, and 5% miscellaneous schist, mica, and detrital heavy minerals.

Physically, the sand is clean, fresh to slightly weathered, angular to subrounded, hard, dense, and essentially equidimensional in shape. The ferruginous siltstone, comprising 4% of the sand is physically soft and friable and capable of imparting a red coloration to the concrete.

There are no apparent potentially deleteriously reactive materials in this sand apt to react with alkalies of cement.

REMARKS:

AGGREGATE DATA SHEET

STATE: Conn.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Materials Lab
LAT.: 41°N	LONG.: 72°W		DATE: March 1975

LAB. SYMBOL NO.: 71-253-2 thru 4 TYPE OF MATERIAL: Processed Trap Rock

LOCATION: New Britain, Connecticut

PRODUCER: Angelo Tomasso, Inc.

SAMPLED BY: N.E.D. R. Gauvreau

TESTED FOR: Park River Local Protection, Hartford, Conn.

USED AT

PROCESSING BEFORE TESTING Crushing and Sizing by Producer

GEOLOGICAL FORMATION AND AGE: Triassic Traprock

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE / SIEVE		1¼"	3/4"	½"	FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN.					
1½ IN.		100			
1 IN.		60			
¾ IN.		6.8	100	100	
½ IN.		0.9	62	95	
⅜ IN.		0.8	24	43	
NO. 4		0.8	1.1	3.1	
NO. 8		0.7	0.8	1.5	
NO. 16		0.7	0.7	1.2	
NO. 30		0.6	0.6	1.1	
NO. 50		0.5	0.5	1.0	
NO. 100		0.4	0.4	0.9	
NO. 200		0.3	0.2	0.8	
-200[a]		0.4	0.3	0.9	
F.M.[b]		9.27	7.14	6.59	

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

		1¼"	3/4"	½"	FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):		2.95	2.94	2.94	
ABSORPTION, PER CENT (CRD-C 107,108):		0.73	1.10	1.13	
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	
SOFT PARTICLES, PER CENT (CRD-C 130):					—
PER CENT LIGHTER THAN SP. GR. ____ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):		4.5	3.4	4.5	
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)		1.0			
ABRASION LOSS (L. A.), %, (CRD-C 117):		10			
UNIT WT., LB/CU FT (CRD-C 106):		103.2	103.5	103.0	
CLAY LUMPS, % (CRD-C 118):					
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128):	Sc, mM/L				
	Rc, mM/L				

MORTAR-MAKING PROPERTIES (CRD-C 116)

TYPE ____ CEMENT, RATIO 7 DAYS, 108.3 % ____ DAYS ____ %

LINEAR THERMAL EXPANSION X10⁻⁶/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):	FINE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.	COARSE AGGREGATE 3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):		F & T	HW-CD	HD-CW
FINE AGG. A. Tomasso, Inc. COARSE AGG: A. Tomasso, Inc.	DFE_{300}	81		
FINE AGG. COARSE AGG:	DFE_{300}			

PETROGRAPHIC DATA (CRD-C 127):

The processed trap rock is comprised of 99 percent basalt and 1 percent miscellaneous weathered basalt and calcite.

Physically, the rock is fresh, dense, angular, rough surfaced and equidimensional in particle shape. More than 99 percent are hard and durable and less than 1 percent is soft or weathered.

There are no apparent potentially deleteriously reactive materials in this basalt apt to react with alkalies of cement.

REMARKS:

STATE: Conn.	INDEX NO.:	AGGREGATE DATA SHEET	TESTED BY: NED Material Lab	
LAT.: 41°N	LONG.: 72°W		DATE: March 1975	

LAB. SYMBOL NO.: 71-253-1 TYPE OF MATERIAL: Processed Sand

LOCATION: Bristol-Southington Town Lines, Conn.

PRODUCER: Angelo Tomasso, Inc.

SAMPLED BY: N.E.D., R. Gauvreau

TESTED FOR: Park River Local Protection, Hartford, Conn.

USED AT

PROCESSING BEFORE TESTING Sizing and Washing at Pit

GEOLOGICAL FORMATION AND AGE: Pleistocene Glaciofluvial

GRADING (CRD-C 103)(CUM. % PASSING):

SIZE / SIEVE					FINE AGG.
6 IN.					
5 IN.					
4 IN.					
3 IN.					
2½ IN.					
2 IN					
1½ IN.					
1 IN.					
¾ IN.					
½ IN.					
⅜ IN.					100
NO. 4					97
NO. 8					94
NO. 16					84
NO. 30					61
NO 50					24
NO. 100					5.0
NO. 200					0.9
- 200[a]					1.1
F.M.[b]					2.35

(a) CRD-C 105 (b) CRD-C 104

TEST RESULTS

					FINE AGG.
BULK SP. GR., SAT SURF DRY (CRD-C 107,108):					2.65
ABSORPTION, PER CENT (CRD-C 107,108):					1.1
ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):	—	—	—	—	1-
SOFT PARTICLES, PER CENT (CRD-C 130):					—
PER CENT LIGHTER THAN SP. GR.____ (CRD-C 129):					—
PER CENT FLAT AND ELONGATED (CRD-C 119,120):					0.6
WEIGHTED AV. % LOSS, 5 CYC. $MgSO_4$ (CRD-C 115)					
ABRASION LOSS (L. A.), %, (CRD-C 117):					
UNIT WT., LB/CU FT (CRD-C 106):					
CLAY LUMPS, % (CRD-C 118)					
SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):					
REACTIVITY WITH NaOH (CRD-C 128): Sc, mM/L:					
Rc, mM/L:					

MORTAR-MAKING PROPERTIES (CRD-C 116)
TYPE____CEMENT, RATIO 7 DAYS, 108.3%, ____ DAYS, ____%

LINEAR THERMAL EXPANSION $X10^{-6}$/DEG. F. (CRD-C 125,126):

ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE

MORTAR:

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):	FINE AGGREGATE				COARSE AGGREGATE			
	3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT: % Na_2O EQUIVALENT:								
HIGH-ALK. CEMENT: % Na_2O EQUIVALENT:								

SOUNDNESS IN CONCRETE (CRD-C 40, 114):	F & T	HW-CD	HD-CW
FINE AGG. A. Tomasso, Inc. COARSE AGG: A. Tomasso, Inc. DFE_{300}	81		
FINE AGG. COARSE AGG: DFE_{300}			

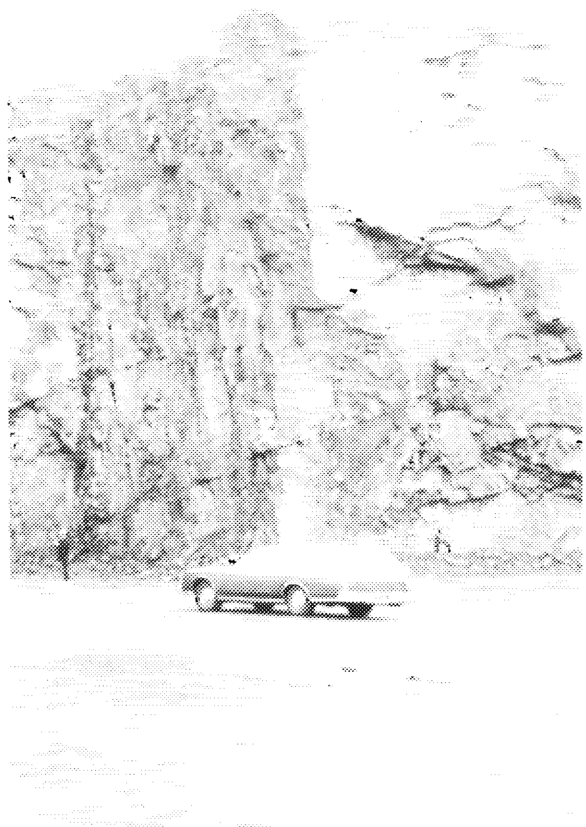
PETROGRAPHIC DATA (CRD-C 127):

The sand is comprised of 75% quartz, 5% feldspar, 8% granitic rock particles, 4% sandstone, 2% siltstone, and 6% miscellaneous mica, schist, and datrital heavy minerals.

Physically, the sand is clean, fresh to slightly weathered, subangular to subrounded, smooth to rough surfaced, and essentially equidimensional in shape. Approximately 3 percent is soft or friable.

There are no apparent potentially deleteriously reactive materials in this sand apt to react with alkalies of cement.

REMARKS:



ANGELO TOMASSO INC.

COARSE AGGREGATE QUARRY

NEW BRITIAN, CONN.

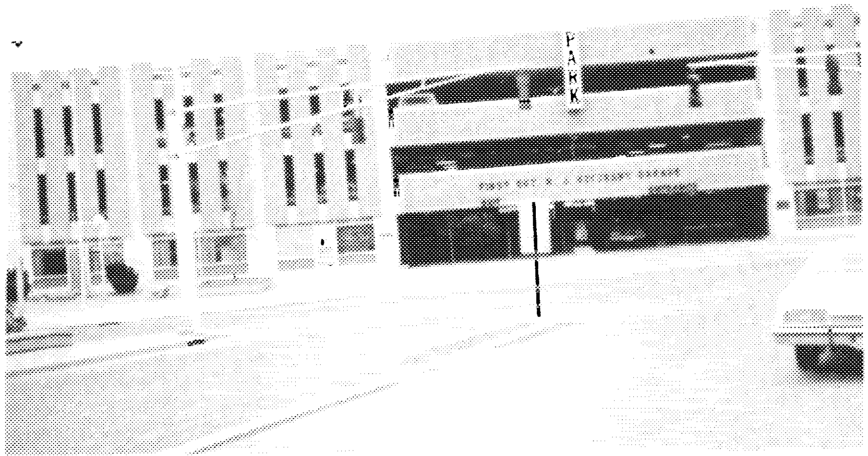
PLATE 4-14

ANGALO TOMASSO INC.

FINE AGGREGATE PIT.

BRISTOL-SOUTHINGTON, CONN.

PLATE 4-15

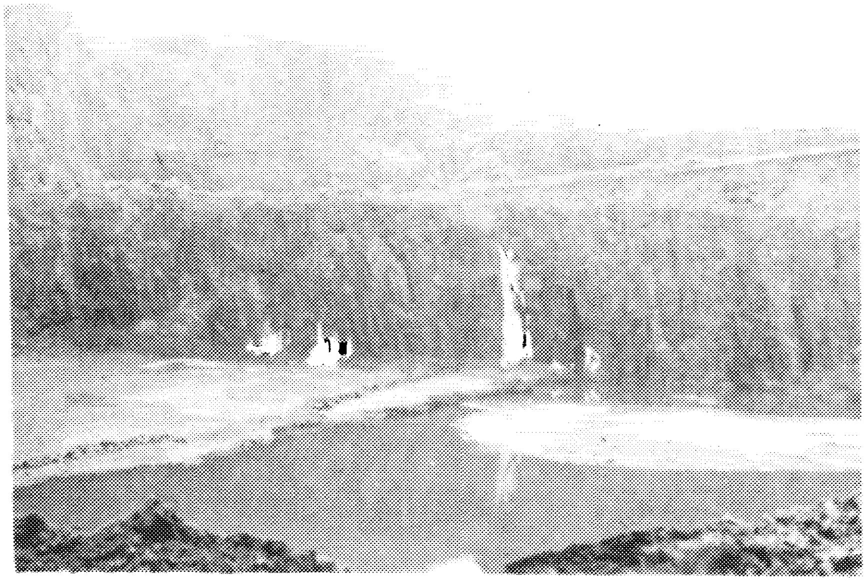


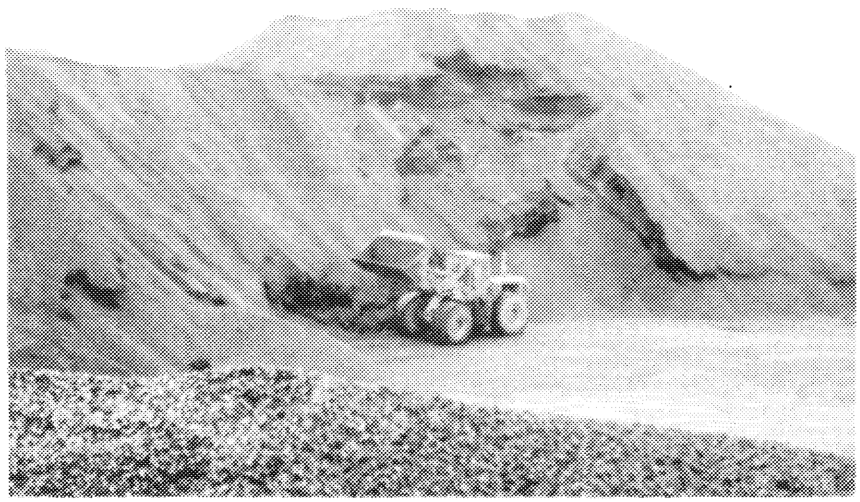
MUNICIPAL PARKING GARAGE
NEW BRITIAN, CONN. (1970)

WEST FARM SHOPPING CENTER
WEST HARTFORD, CONN. (1974)

SHERMAN TOMASSO - CONCRETE
ANGELO TOMASSO INC. -AGGREGATE
SERVICE RECORD

PLATE 4 16





THE BALF CO.

COARSE AGGREGATE QUARRY

NEWINGTON, CONN.

PLATE 4-17

THE BALF CO. FINE AGGREGATE PIT

SOUTH GLASTONBURY, CONN.

CONSTITUTION PLAZA

HARTFORD CONN. (1959)

MANCHESTER SAND & GRAVEL-CONCRETE

THE BALF CO.-AGGREGATE

SERVICE RECORD

PLATE 4-18

CIVIC CENTER HARTFORD, CONN. (1975)

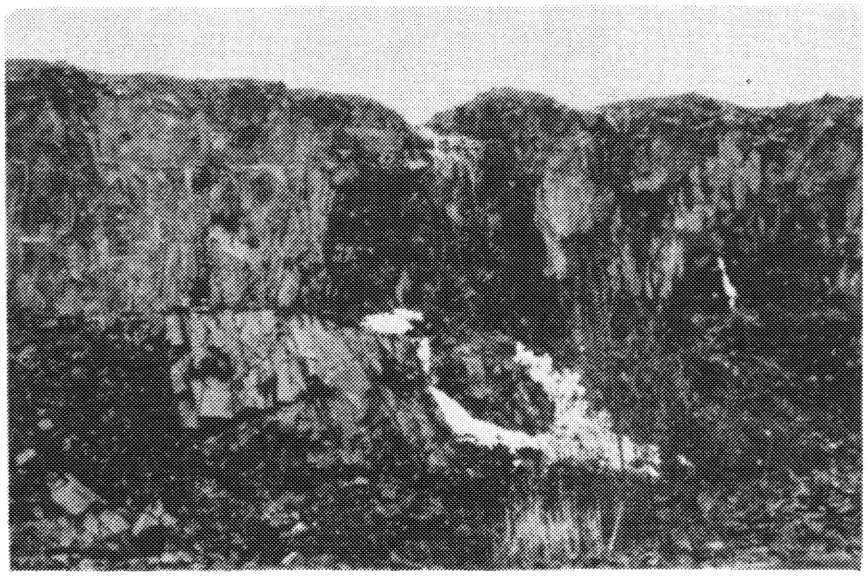
SHERATON
HARTFORD
CONN. (1975)

MANCHESTER SAND & GRAVEL-CONCRETE

THE BALF COMPANY-AGGREGATES

SERVICE RECORD

PLATE 4-19

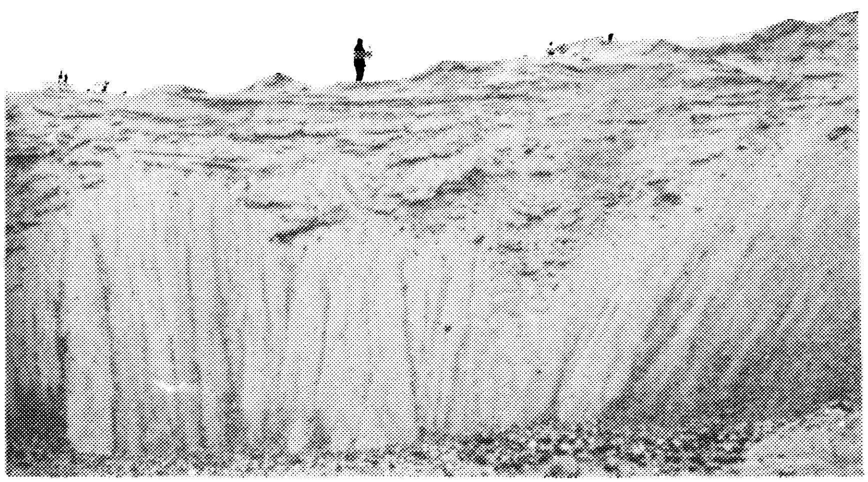


RONCARI INDUSTRIES INC.

COARSE AGGREGATE QUARRY

EAST GRANBY, CONN.

PLATE 4-120



FINE AGGREGATE PIT

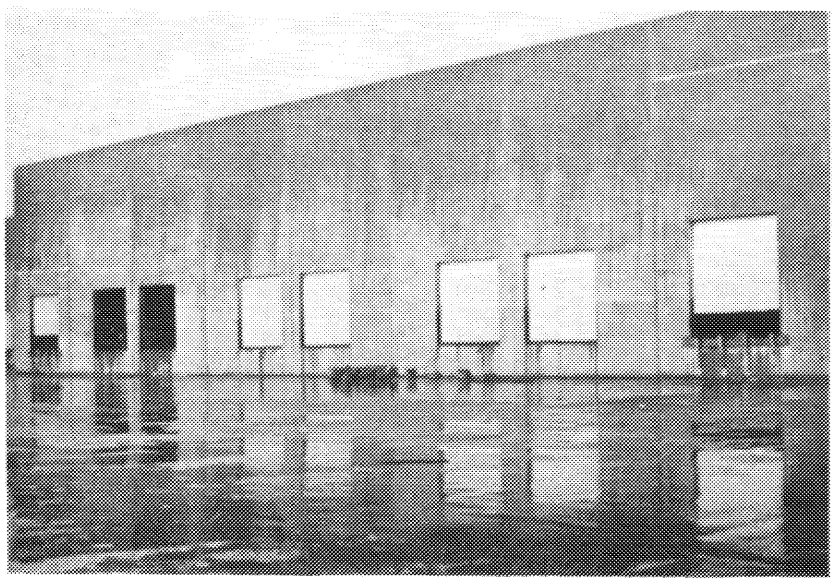
RONCARI INDUSTRIES INC.

GRANBY, CONN.

PLATE 4-21

HOLIDAY INN

HARTFORD, CONN. (1970)



BRADLEY INTERNATIONAL WAREHOUSE

WINDSOR LOCKS, CONN. (1973)

RONCARI INDUSTRIES INC.

SERVICE RECORD